Report No. UT-06.18

UDOT RESEARCH DIVISION ANNUAL WORK PROGRAM

FISCAL YEAR 2007

Prepared By:

Utah Department of Transportation
Research Division
Salt Lake City, Utah

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April 2007

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UDOT RESEARCH & DEVELOPMENT REPORT ABSTRACT

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16. Abstract

The UDOT Research Division is charged with promoting, executing and implementing research activities within the Utah Department of Transportation, to further the mission of the Department and increase the Department's use of new products and techniques. Aided by the Federal Highway Administration, and in collaboration with other public and private entities, the Research Division manages a program funded by federal and state agencies toward these goals.

This annual Work Program document outlines the structure and programs of the UDOT Research Division, presents the budget for Fiscal Year 2007, and lists the projects which will be undertaken during this year. This information satisfies the Federal requirement for reporting the appropriate allocation and use of Federal funds in a state transportation research program. A certification of compliance with Federal regulation is included in this report.

The budget allocated for UDOT research activities during Fiscal Year 2007 includes $2.332 million from federal funds, some of which is being rolled over from previous years for on-going projects, and $1.107 million from state funds. State funds include those funds required to match the federal contribution. The overall multi-year research program currently consists of research projects totaling $5.10 million.

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EXECUTIVE SUMMARY

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INTRODUCTION

Research, one of the principal missions of the first U.S. national highway program in 1921, remains a critical component of the successful operation of the Utah Department of Transportation (UDOT). The UDOT Research Division is the entity within the Department with the charge to promote, execute and implement research activities. These activities are broad, ranging from advancing the science of transportation engineering in emerging areas to implementing the use of new products on a daily basis. The research reach involves planning, design, construction, operations, and maintenance activities. Individual research efforts sometimes involve periods of a few months, and other times require many years to run their full course. These research activities are also collaborative, involving the many entities within the Department, the Federal Highway Administration (FHWA), and the partners in the civil engineering academic, consulting, manufacturing, and construction world. Funding for these research endeavors comes primarily from the FHWA and the State of Utah, but other Federal, State, and private sources also contribute.

Federal law requires that states spend a portion of their federal transportation funding for transportation research. US Code Title 23, Section 505 stipulates that two percent of the transportation funds apportioned to the states in a given year be used for research and planning activities. This amount is known as the State Planning and Research (SPR) fund. The Code further defines that at least 25% of the SPR funding be used specifically for “research, development, and technology transfer activities” related to transportation. Further, federal regulation mandates that the states certify the proper use of these SPR funds and appropriately manage them. Chapter 23 of the Code of Federal Regulations (CFR), Section 420, requires states to develop, establish, and implement a management process that identifies and implements research, development and technology transfer activities to address priority transportation issues, including the development of an annual work program. The elements of the program must be documented to ensure effective use of the funds.

This document constitutes the work plan stipulated by the federal regulation, outlines the program for transportation research at UDOT during federal and state fiscal years 2007, and documents the progress of that research. Appendix A of this report contains the required Certification of Compliance and an FHWA approval letter.

The mission of the UDOT Research Division is:

Tools for Better Transportation Tomorrow

This mission statement reflects the mission statement of the Department, which is "Quality Transportation Today, Better Transportation Tomorrow." The Research Division provides an essential and meaningful role in helping the Department realize this mission, paving the way to the future in Utah transportation.

In developing a focus for research efforts, the Research Division aligns its program with the four Strategic Goals of the Department, namely:

Take Care of What We Have
Make the System Work Better
Improve Safety
Increase Capacity

Many of the research projects and efforts undertaken help the Department to reach these goals, providing better and more economical ways to provide a safe and secure ride to the public. The UDOT Research Division was separated from the Materials Division in 1993, bringing research projects, product evaluation and development, and technology transfer activities into a central, and somewhat autonomous, function. The Research Division is housed within the UDOT Project Development Group, along with many other central design and support functions.

The current Research Division staff consists of eleven individuals. These people are as follows:

Name	**Title**	**Responsibilities**
Rukhsana Lindsey, P.E.	Director of Research	Leadership, Division Management, Maintenance and Traffic & Safety Projects
Michael Fazio, P.E.	Deputy Director of Research	Division Management, Hydraulics and Environmental Project Management
Daniel Hsiao, P.E.	Sr. Research Project Manager	Project Management, IBRC Projects, Structures Projects, Prefabricated Structures
Blaine Leonard, P.E.	Sr. Research Project Manager	Program Funding, UTRAC Workshop, Project Management, Seismic and Geotechnical Projects
Doug Anderson, P.E.	Research Project Manager	Project Management, Data Almanac, Planning Projects
Ken Berg, P.E.	Development Engineer	Experimental Features, Project Management
Richard (Barry) Sharp	New Products Manager	New Products Processing and Testing
Abdul Wakil	Technology Transfer Engineer	Technology Transfer and Implementation, Library
Debbie Heim	Research Technician	Experimental Features and Project Support
Esther Olsen	Executive Secretary	Program Support, Office Support
Mumtaz Mullahkhel	Librarian	Document Processing, Mail Services, Literature Searches
Raeleen Sanchez	Financial Analyst	Project Accounting and Tracking

RESEARCH DIVISION PROGRAMS AND SERVICES

The UDOT Research Division is responsible for a variety of programs. These can be summarized in the following four areas:

- Applied Transportation Research Projects
- New Product Evaluation
- Experimental Features Program
- Technology Transfer

Applied Transportation Research Projects

Research activities cover a broad range of objectives and employ varied methodologies and approaches. The primary goal of research activities is to identify the needs of the Department and to meet those needs with techniques, information, tools, products, resources, and training. These activities advance the state of the art, identify useful scientific tools, and evaluate materials and processes which can bring innovation to our work. Research efforts are generally applied, that is, they focus on results that can be implemented in the near future.

Historically, research objectives have included measurement of material properties and their longevity, verification of new and extended design practices, evaluation of the effectiveness of current procedures, application of new technologies, consideration of economic benefits, and development of policy. Topics have included structures, foundations, pavements, roadway geometrics and design, hydraulics and hydrology, traffic planning, traffic safety, intelligent traffic systems, environmental considerations and impacts, maintenance, and construction processes and management. Methodologies used to advance research projects include literature searches, surveys, synthesis of practice, computation and analysis, physical and analytical modeling, physical testing, and long-term monitoring. Studies can be brief and fairly superficial, long-term and complex, or anywhere in between, depending on the goals of the research.

The benefits of research are also varied. Some projects demonstrate that a new technique or tool is not effective, not useful, or not applicable to the Department. This result forestalls the use of this new approach and saves time and money in later failed efforts. Some projects validate processes that are already in use, and verify that these techniques are still applicable and valuable. These projects sometimes determine that minor changes will yield higher efficiency, or produce manuals, specifications or training to improve the use of existing procedures. Other projects demonstrate that new materials, techniques or tools are successful and applicable, and encourage those to be implemented in the Department. Previous studies have suggested that every dollar invested in research within the Department yields twelve dollars of return, on the average.

The selection of research projects to be undertaken usually follows one of several processes. The primary process is the UTRAC Workshop, from an acronym for the Utah Transportation Research Advisory Council. Other sources of research projects include directives from senior Department leaders or the state legislature, projects associated with special funding opportunities

(Innovative Bridge, Pooled Fund, the I-15 National Test Bed, etc.), and projects developed as follow-on phases of future projects.

The UTRAC Workshop is a collaborative, annual workshop, organized to assess the needs of the Department and define research projects to address those needs. The UTRAC Workshop was initiated in 1993, and has been a very successful process. The process has been modified several times, and underwent some significant revisions in 2005. The revised process initiated in 2005 was recognized with an AASHTO President's Award for Research.

The key steps employed in the UTRAC research prioritization process at UDOT are shown below. Although the workshop plays a central role in the process, a number of steps are needed before and after the workshop to make the process complete. The steps are:

1. Needs are evaluated in nine separate discipline areas. A UDOT key leader is selected to lead each group, and a Research Division contact person works with each group. The discipline areas are:

    a. Construction
    b. Maintenance
    c. Materials & Pavements
    d. Hydraulics
    e. Environmental
    f. Planning & Asset Management
    g. ITS & Traffic and Safety
    h. Geotechnical
    i. Structural

2. Late in the calendar year, Problem Statements are solicited from UDOT personnel, University researchers, consultants, and others. These Problem Statements define a need within the Department, and also identify a key UDOT Champion who will direct the research, a basic scope of work, and a plan for implementation.

3. The Research Division staff contact for each discipline group reviews the submitted Problem Statements. Their review includes a literature search to determine if similar work has been performed in Utah or elsewhere, or if significant knowledge on the topic is available as the Problem Statement is discussed. The scopes are evaluated to insure that well-defined work tasks and clear deliverables are envisioned, and that implementation is feasible.

4. A one-day workshop is convened to review the Problem Statements and prioritize them. The workshop includes about 150 people from UDOT, FHWA, key consulting and construction firms, the three research universities in Utah, other state agencies, and the public. The workshop is usually held in March. During the workshop, each of the discipline area groups meet to discuss, evaluate, and prioritize the Problem Statements.

5. The highest priority Problem Statements (about 20 to 25 projects) are listed for funding, and the list is approved by Senior Leaders.

6. Available research funding (from Federal and State sources) is applied to the list of prioritized Statements, and a Project Manager (PM) is assigned to manage the project, along with the UDOT Champion. The research funding comes from the annual Research Division project budget.

7. Principal Investigators are selected, a Technical Advisory Committee (TAC) is created to provide oversight to the research, the project scope is refined, and contracts are written for the work.

8. During the duration of the project, the Champion, TAC, and PM monitor the work, get progress reports, and prepare for implementation of the results. Project durations range from six months to several years, depending on the project.

9. Projects are completed, final reports are provided, edited and published, and tools are provided. Implementation is initiated with the Champion and other UDOT participants.

As indicated, the list of projects identified and prioritized by the workshop participants is reviewed and approved by senior leaders in the Department. This provides the opportunity for those leaders to modify priorities, remove projects, or add projects which better support the strategic direction and goals of the Department. At other times of the year, these leaders occasionally direct that other projects be initiated, usually because of newly arisen needs, opportunities in the industry, or to meet needs identified by or as a result of decisions from the state legislature.

Research projects are sometimes initiated by various Divisions within the Department as a result of their efforts to secure outside funding. In many cases, the Research Division becomes involved in the management of these projects. Examples include the annual Innovative Bridge program operated by the FHWA, instituted to encourage innovative techniques, methods and materials in the construction and operation of highway bridges. Innovative Bridge funds are applied for based on individual projects, and are usually applied toward the added costs of innovative features and the monitoring or evaluation of those features. Another special program is the I-15 National Test Bed, a special appropriation from Congress to take advantage of research opportunities on the I-15 Reconstruction Project in Salt Lake County.

Another source of research projects is the Pooled Fund program, also operated by the FHWA. Pooled Fund is a tool for states to pool their resources to accomplish common purposes. Any state, or the FHWA, can initiate a Pooled Fund project by simply soliciting interest from other agencies. After the solicitation, interested parties contribute funds to a central account, and jointly participate in the management and oversight of the project. The original solicitor is usually the leader and manager of the Pooled Fund project. Projects initiated by UDOT through one of the processes described above can, and sometimes are, be funded and managed as Pooled Fund projects. Since these projects arise throughout the year, funding is applied to individual projects from Research Division resources at the discretion of the Research Division Director.

The UDOT Research Division also supports the Transportation Research Board, which hosts an annual transportation research conference, and the FHWA National Cooperative Highway Research Program (NCHRP), which undertakes research of interest to many states, and other similar federal programs.

At the completion of a research project, the Research Division participates in the publication and distribution of reports, manuals, and specifications, the preparation and execution of training seminars and workshops, and the process of implementing the results into practice within the Department. Reports are also made available on the Research Division web page, and in hard copy to public libraries.

New Product Evaluation

The Research Division has the primary responsibility for managing and conducting the new product evaluation process for UDOT. Each year, over one hundred requests are received from vendors of various transportation-related products to have their product used on UDOT projects. The New Product Evaluation program processes and evaluates these requests, using a consistent, unbias, methodical approach to prioritizing the evaluation and approval of these products.

Vendor requests are submitted on a standardized form, and are reviewed by the New Products Manager. They are then submitted to the New Product Evaluation Panel (NPEP), which meets monthly to review the submitted products. This panel is composed of individuals from various functional units within UDOT that are concerned with the use of products and materials. They determine whether the product meets UDOT specifications, does not meet specification, or requires further evaluation. Those products that meet UDOT specification are entered into an Accepted Product Listing (APL), and are available for use by UDOT Preconstruction and Construction personnel, their Consultants and Contractors. Those that do not meet the specification, but are considered to meet other Department needs not addressed by UDOT specifications, are entered into a Performance Data Products Listing (PDPL), which documents the features and performance of the specific product. These lists are maintained as a permanent database, and are published and distributed within the Department. Products that do not meet either of the above criteria are classified 'Informational' and files are kept in the database for reference.

Another component of the New Product Evaluation process in participation is the AASHTO National Transportation Product Evaluation Panel (NTPEP), a cooperative, nation-wide effort to share data on new products. UDOT participates in the panel as a voting member, and financially supports the program. Successful evaluation of a product by NTPEP may eliminate the need and cost of evaluating the same product at UDOT.

Experimental Features Program

Selected projects from the New Products Evaluation program occasionally warrant field testing to verify their performance. These field tests, usually on a small scale, are known as Experimental Features. The Research Division is responsible for testing these new products,

providing a real life test bed, and checking the product's specific features before recommending their use on the highways.

Experimental Features testing usually addresses such issues as installation techniques, material handling, construction, and product durability. The results of these tests are published and distributed within the Department. In addition, the progress and results of these tests are provided on the Research Division web page. Based on the results of Experimental Feature testing, products may be added to the APL of PDPL lists described above.

Technology Transfer

Technology Transfer initiatives are also the responsibility of the Research Division. Technology transfer includes the distribution of publications, sharing of research results, preparation of a Research Division newsletter, sponsoring periodic presentations on relevant topics, searching the available literature for information on questions and issues that arise within the Department, maintenance of the Research Division web page, and managing the Lester Wire Library at the UDOT headquarters complex.

A series of video conference workshops, known as WASHTO-X, is also part of the Technology Transfer program. This program, a cooperative initiative of FHWA and several western state DOTs (thus the Western AASHTO Information Exchange acronym), facilitates the sharing of information, ideas, and practices among the states.

The Local Technical Assistance Program (LTAP) is also a responsibility of the Technology Transfer program. LTAP, operated through Utah State University in Logan, Utah, serves local government agencies through training and technical support. Innovative products, methods, and processes used at UDOT are shared through this program. In addition to this annual program, the LTAP staff at Utah State has initiated a special program during this year to showcase new products and techniques. Known as the LTAP Showcase, some dedicated federal funding will be used to fund this program during FY 2007.

FUNDING

Funding for research efforts at UDOT is provided by various federal and state sources. The primary sources of funding are the State Planning and Research Program (SPR) and the State Construction and Administration funds. Other federal funding is made available through programs like the Innovative Bridge program, the I-15 National Test Bed special appropriation from Congress, other state funds allocated by the Department, funds from other states assembled in the Pooled Fund system, and matching funds through the University Transportation Center program or private sources.

State Planning and Research (SPR)

For many years, the federal government has supported transportation research at the state level though the allocation of State Planning and Research funds. The 1991 Intermodal Surface Transportation Efficiency Act (ISTEA), a multi-year transportation funding bill, mandated that at least 25% of the SPR funds provided to each state be spent on research, development, and technology transfer activities.

For fiscal year 2007, the SPR program will provide approximately $1.23 million new dollars for research efforts at UDOT. This allocation is the largest single piece of funding used by the Research Division. Because of the cash flow of some long-term projects, and delays in other projects, some of the FY 2006 SPR allocation is also available for use during FY 2007. Federal SPR funds are matched 80/20 with state funds.

Special Federal

In addition to the SPR allocation, other federal funds available for research efforts at UDOT during fiscal year 2007 include Innovative Bridge funds, remaining funds from the I-15 National Test Bed, and federal funding of the LTAP program.

Innovative Bridge funds are typically awarded each year to individual projects deemed meritorious by the FHWA. Over the past several years, UDOT has been awarded annual amounts on the order of $0.5 million for specific bridge projects where innovations are proposed. Given the long lead time involved in some of these projects, and the delay in funding awards, several of these Innovative Bridge projects are still open and have unspent, but budgeted, funding. Some of this funding will be used in FY 2007, and the remainder will be carried forward to FY 2008.

During the late 1990's, UDOT embarked on an unprecedented reconstruction of the I-15 corridor in Salt Lake County. The $1.4 billion, 16.5-mile urban design-build project was the largest of it's kind in the United States, and presented a unique research opportunity. With 142 bridge structures slated for demolition and replacement, UDOT and its research partners developed a research program aimed primarily at the full-scale testing of bridges and foundations. Thirty-one research projects were identified for funding, and $4.7 million was obtained to fund those projects. The largest share of that funding package was a special congressional appropriation, through the TEA-21 funding bill, of $3.8 million, including a 20% state match. The I-15 Test

Bed program was executed in four phases. Although the reconstruction project is long since completed, a few of the research projects are still underway, and a portion of the Phase IV allocation is still available to help fund those projects.

The FHWA typically provides annual funding to support the LTAP program. For fiscal year 2007, this amount is $112,500. This amount is matched with an equal amount of state funds. In addition, the LTAP center at Utah State University sought, and was granted, additional funds for a Product Demonstration Showcase program. These funds pass through the UDOT Research Division and are administered by the Division.

Special Federal Matching Funds

In order to foster transportation research at the nation's universities, and to encourage cooperation between these universities and the state Departments of Transportation, the U.S. Department of Transportation has instituted a University Transportation Centers (UTC) program, administered by the Research and Innovative Technology Administration (RITA). With funding and direction from the newest federal transportation funding bill, "2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users" (SAFETEA-LU), the Mountain Plains Consortium (MPC) regional UTC has received renewed funding, and Utah State University has been designated as a Tier II UTC. The MPC UTC is a consortium of 10 universities, centered at North Dakota State University. The Traffic Lab of the University of Utah Civil and Environmental Engineering Department, in Salt Lake City, is a participant in the MPC, and receives funding to be used as matching money on research projects. The new Tier II UTC at Utah State University, in Logan, Utah, also receives money to be used as matching funds for transportation research projects. The UDOT Research Division is a beneficiary of both of these UTC matching fund programs in fiscal year 2007.

State

UDOT provides state funds, from the State Administrative and State Construction budgets to help support research efforts. State funding comprises the second largest portion of the Research Division revenue budget. State Construction funds are typically used to match federal funds in the research program. State Administrative funds are typically allocated directly to research projects.

Pooled Fund

Projects are sometimes initiated as a joint effort by the FHWA and several states. The entities pool their resources to pursue research efforts of common interest. This Pooled Fund program is administered by the FHWA. Each agency who commits to a given project contributes a portion of the funding for that project, from their SPR or other funding sources. In cases where UDOT is the state leading a given research project, funds from the other participating states may show up as revenue to the project, depending on how the funds for that specific project are administered and spent.

RESEARCH PROJECTS

A broad variety of research projects are underway, or are slated for initiation, at the beginning of fiscal year 2007. A number of projects have also been completed during the course of fiscal year 2006. The continuing projects, new projects, pooled fund projects, and completed projects are outlined below, and a table of the individual projects in each category is provided.

At the beginning of fiscal year 2007, the Research Division is managing sixty two research projects, with a total project budget of $5.1 million. This stated budget includes direct contract cost and overhead administration cost for the entire duration of each project, not just fiscal year 2007. Table 1, below, summarizes the number of projects, and amount of total funding, in each of ten discipline areas at UDOT. Figures 1 and 2 present this program balance in graphical form.

Table 1: Research Program Balance

Discipline Area	Projects	% Program	Funding	% Funding
Administration	2	3.2%	24,900	0.5%
Construction	3	4.8%	160,199	3.1%
Environmental	3	4.8%	350,000	6.9%
Geotechnical	8	12.9%	720,596	14.1%
Hydraulics	5	8.1%	268,276	5.3%
Maintenance	5	8.1%	696,955	13.7%
Materials & Pavements	8	12.9%	632,309	12.4%
Planning	2	3.2%	100,000	2.0%
Structures	14	22.6%	1,455,071	28.5%
Traffic & Safety	12	19.4%	692,043	13.6%
Total	**62**	**100%**	**$5,100,350**	**100%**

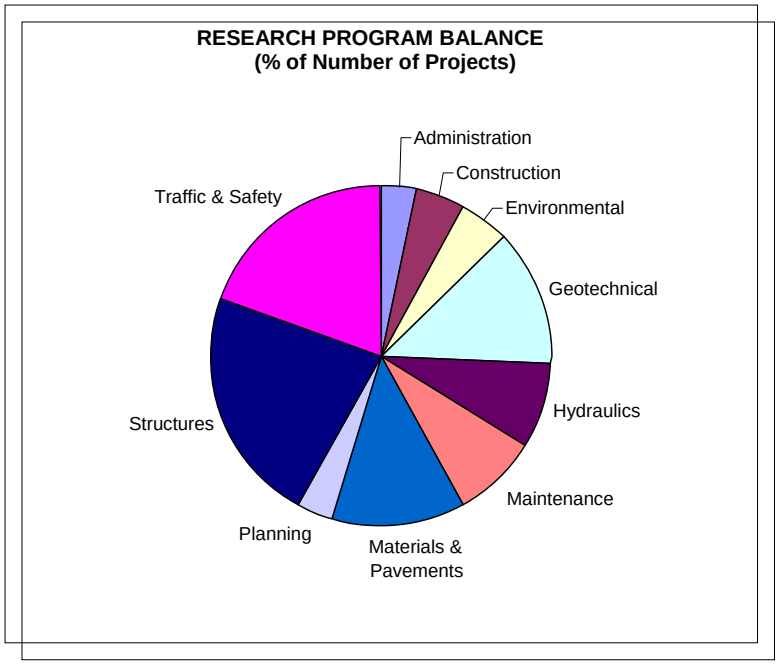

Figure 1. Research Program Balance: Relative proportion of the number of research projects in each discipline area.

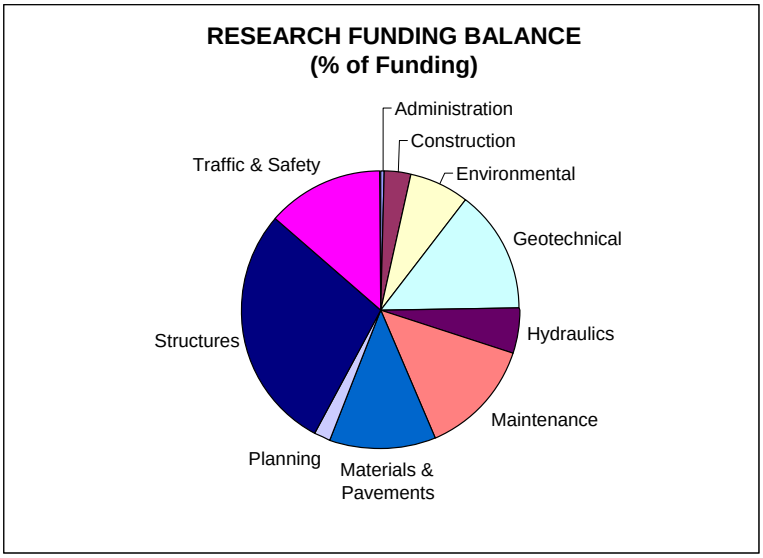

Figure 2. Research Funding Balance: Relative proportion of research project funding in each discipline area.

A brief status report on each project active during fiscal year 2006 is included in Appendix B of this program document. These reports include those projects which were completed during the year, and those which will continue to be active during fiscal year 2007. These reports are

organized by funding source, and within each funding source category, are listed in order of the Research Project Identification Code (PIC).

The Research PIC number is a code assigned to each research project at the point in time when the project is conceived. The PIC number reveals the source of the project and the year it was initiated. The first two characters in the number indicate the genesis of the project; "UT" indicates the project was initiated at the UTRAC Workshop, "AM" indicates the project was initiated under the direction of UDOT"s senior leaders ("Administrative Mandate"), and "TB" indicates that the project initiated from the I-15 National Test Bed program. The next two characters indicate the year the project was initiated. This represents the beginning of the project, not the beginning of funding or the execution of a contract. Many projects are assigned a PIC when they are initiated, but may never be funded or executed. Finally, the last three characters represent a numerical sequence of projects in that specific category or year. As an example, the PIC number UT05.304 was assigned to a project initiated during the 2005 UTRAC Workshop, and was the fourth project created by Group 3 at the workshop, the Materials and Pavements group.

Continuing Projects

The 49 projects continuing from previous years primarily include projects with multi-year scopes of work, but also include some shorter term projects that did not get initiated at the beginning of the fiscal year. The 26 continuing projects supported by federal SPR funds are listed in Table 2. The three continuing Innovative Bridge projects, the three continuing I-15 National Test Bed projects, and the two LTAP programs are listed in Table 3. The 15 continuing projects supported by state funds are listed in Table 4. These tables also present data indicating the Research Project Manager, Principal Investigator, the Division of UDOT being served by the project, and various contract and tracking numbers. These projects are listed in order of the Project Number from the FINET financial tracking software system.

The budget for FY 2007, and the anticipated budget for FY 2008 are shown for each project in these three tables. Note that the projected budgets for FY 2007 and FY 2008 do not equal the contract amount because some expenditures may have already been made, some expenditures might be projected beyond FY 2008, and non-contract costs, such as overhead and management costs are included in the budget figures. The total budget figures, shown at the bottom of the tables, is reflected on the FY 2007 budget sheet described in the next section.

TABLE 2: CONTINUING SPR-FUNDED PROJECTS

PROJECT ID CODE (PIC)	FY07 PROJECT #	DESCRIPTION	PM	DIVISION	ORIG. BUDGET	CONTRACT INFO PI	FY07 BUDGET	FY08 BUDGET
UT98.504	5H05411H	DOWN-DRAG OF PILES	LEONARD	GEOTECHNICAL	$30,000	ROLLINS	$32,275	$0
UT00.305	5H05413H	BRIDGE SCOUR COUNTERMEASURES	HSIAO	HYDRAULICS	$45,000	ZUNDEL	$13,148	$0
TB98.029a	5H05415H	LONG TERM MONITORING OF I-15 EMBANKMENT	LEONARD	GEOTECHNICAL	$150,000	BARTLETT	$40,000	$150,588
AM04.001	5H05416H	PREVENTIVE DECK JOINT & SURFACE TREATMENT STRATEGY	HSIAO	STRUCTURES	$80,000	GUTHRIE	$0	$0
AM03.002	5H05417H	WEB-BASED PAVEMENT CONDITION & TRAFFIC DATA	ANDERSON	MATERIALS, TRAFFIC &	$43,000	PERRETT	$21,716	$0
AM03.004	5H05418H	EXTRACT VEHICLE CLASSIFICATION FROM TOC VIDEO	ANDERSON	PROGRAM DEVELOPMENT,	$46,400	CHENG	$24,000	$40,538
TB01.404	5H05419H	N/D EVAL. METHOD TO DETERMINE RESIDUAL STRESS IN GIRDERS	LEONARD	STRUCTURES	$175,000	BARR	$80,000	$54,271
TB01.405	5H05420H	STRUCTURAL HEALTH MONITORING OF I-15 STRUCTURES	LEONARD	STRUCTURES	$140,000	HALLING	$60,000	$61,472
UT03.203	5H05421H	MATERIALS CHARACTERIZATION FOR THE AASHTO 2002 PAVEMENT DESIGN GUIDE	ANDERSON	MATERIALS	$150,000	DARTER	$90,000	$62,462
UT03.201	5H05422H	UTAH LTPP MONITORING	ANDERSON	MATERIALS	$50,000	ROMERO	$47,964	$0
UT03.503	5H05423H	MONITORING SPLICED GIRDERS, DECK PANEL JOINTS & FRP RETROFIT	HSIAO	STRUCTURES	$30,000	PANTELIDES	$32,500	$0
AM05.001	5H05424H	EVALUATION STUDY OF ADVANCED SIGNAL WARNING DEVICES	LINDSEY	TRAFFIC & SAFETY	$47,000	SCHULTZ	$15,000	$7,100
UT05.304	5H05426H	FULL-DEPTH RECYCLING & STABILIZATION OF PAVEMENT BASE LAYERS	ANDERSON	MATERIALS	$100,000	GUTHERIE	$33,000	$23,750
UT05.606	5H05427H	ADVANCED WARNING SIGNAL SITE SELECTION EVALUATION MATRIX	LINDSEY	TRAFFIC & SAFETY	$35,000	SCHULTZ	$30,000	$11,015
UT05.703	5H05428H	SOLITATION 950: DYNAMIC PASSIVE PRESSURE ON ABUTMENTS & PILE CAPS	HSIAO	GEOTECHNICAL	$210,000	ROLLINS	$60,000	$40,000
UT05.801	5H05429H	INVESTIGATION OF IMPROVEMENT OF DECK CONCRETE MIX DESIGN & CURING PRACTICES	HSIAO	STRUCTURES	$71,000	BARR	$40,000	$39,265
UT05.301	5H05430H	ASPHALT BINDER UNIFORMITY	ANDERSON	MATERIALS	95,000	DONGRE	$100,000	$23,500
UT05.402	5H05431H	BRIDGE SCOUR COUNTER MEASURES PHASE 2	HSIAO	HYDRAULICS	$50,995	ZUNDEL	$22,319	$20,000
UT05.503	5H05432H	ACCESS MANAGEMENT PERFORMANCE INDEX	ANDERSON	TRAFFIC & SAFETY	$35,000	SCHULTZ	$20,000	$18,675
UT05.702	5H05433H	PROGRAMMING OF STRONG GROUND MOTION INSTRUMENTATION OF NEW BRIDGES	LEONARD	STRUCTURES	$30,000	HALLING	$30,000	$27,660
UT05.401	5H05434H	DESIGN & DEVELOP OF A CONTEXT SENSITIVE VISUAL RESOURCE ASSESSMENT SYSTEM	LINDSEY	ENVIRONMENTAL	$88,000	ELLSWORTH	$60,000	$54,400
UT05.706	5H05435H	GEOPHYSICAL METHODS TO PRIORITIZE MITIGATION OPTIONS FOR SR-9 AT COAL HILL LANDSLIDE	LEONARD	GEOTECHNICAL	$19,950	ASHLAND	$8,970	$0
MPC06.001	5H05436H	ON-LINE TRAFFIC ASSESSMENT OF CREATIVE HIGHWAY ADMINISTRATION TECHNIQUES	ANDERSON	ENGINEERING SERVICES	$75,000	MARTIN	$0	$0
AM05.002	5H05437H	EVALUATING DESIGN-BUILD CONTRACTING METHODS FOR STIP PROJECTS 2005-2007	ANDERSON	CONSTRUCTION	$75,000	MARTIN	$0	$0
UT05.102	5H05438H	WORK ZONE TRAFFIC CONTROL MEASURES & CRASH OCCURRENCE	ANDERSON	CONSTRUCTION	$35,606	SAITO	$10,000	$0
AM05.004	5H05458H	EVALUATION OF THE UDOT WEATHER OPERATIONS/RWIS PROGRAM PHASE 1	ANDERSON	OPERATIONS	$35,000		$35,000	$0
						TOTAL:	$905,892	$634,696

TABLE 3: CONTINUING SPECIAL FEDERAL-FUNDED PROJECTS

PROJECT ID CODE (PIC)	FY07 PROJECT #	DESCRIPTION	PM	DIVISION	ORIG. BUDGET	CONTRACT INFO PI	FY07 BUDGET	FY08 BUDGET
INNOVATIVE BRIDGE								
IB01.001	5076608H	FEASIBILITY OF USING HIGH STRENGTH STEEL & MMFX REBAR IN BRIDGE DESIGN	HSIAO	STRUCTURES	$44,500	BARR	$22,535	$0
IB02.001	5067601D	STAINLESS CLAD REBAR & HPS PERFORMANCE (RT 79 MP2 WEBER CO.)	HSIAO	STRUCTURES	$83,000	PAUL CARTER	$5,191	$0
IB03.001	5090108H	INNOVATIVE BRIDGE RESEARCH & CONSTR.-RAPID DECK REPLACEMENT	HSIAO	STRUCTURES	$115,000	HARDEE	$85,000	$120,566
						TOTAL	**$112,726**	**$120,566**
I-15 NATIONAL TEST BED								
TB01.401	5073511H	LOAD RATE EFFECT ON AXIAL & LATERAL PILE CAPACITY	LEONARD	GEOTECHNICAL	$150,000	ROLLINS, JENSEN	$43,272	$0
TB01.407	5073512H	CONSOL & DRAIN PROP SOFT SOIL	BERG	GEOTECHNICAL	$144,000	BARTLETT	$0	$0
TB01.409	5073513H	I-15 TESTBED PROG. DEV.	LEONARD	GEOTECHNICAL	$55,000	N/A	$45,961	$0
						TOTAL	**$89,233**	**$0**
LTAP PROGRAM								
MP07.001		FY07 LTAP ANNUAL CONTRACT (INCLUDING 50% STATE MATCH)	WAKIL		$225,000	BOLLING	$225,000	$0
MP06.001	5234115D	PRODUCT DEMONSTRATION SHOWCASE PROGRAM(LTAP)	WAKIL		$75,000	BOLLING	$75,000	$0

TABLE 4: CONTINUING STATE-FUNDED PROJECTS

PROJECT ID CODE (PIC)	FY07 PROJECT #	DESCRIPTION	PM	DIVISION	ORIG. BUDGET	CONTRACT INFO PI	FY07 BUDGET	FY08 BUDGET
TB00.302	8RD0711H	DYNAMIC CHARACTERISTICS OF NEW BRIDGES I-15 Test bed Ph 3	LEONARD	STRUCTURES	$109,000	HALLING	$15,500	$0
TB00.305	8RD0712H	STRONG MOTION INSTRUMENTATION OF BRIDGE SITE-I-80,SR-201 Seismic Instrumentation	LEONARD	STRUCTURES		PORCELLA	$3,162	$0
UT02.403A	8RD0713H	SMART PDA- IMPLEMENTATION VAN SOFTWARE	ANDERSON	MATERIALS	$75,000	CHENG	$0	$0
AM03.003	8RD0714H	SLIPPERY PAVEMENT SAFETY ANALYSIS -DATA MINING PROGRAM	ANDERSON	TRAFFIC & SAFETY	$10,000	PERRIN	$0	$0
AM03.001	8RD0715H	EVALUATE WORK ZONE TRAVELER INFORMATION SYSTEMS	LEONARD	TRAF & SAFETY, CONSTRUCTION	$80,000	SAITO	$17,535	$0
AM05.003	8RD0716H	ASSESSING THE SAFETY IMPACTS OF ACCESS MANAGEMENT TECHNIQUES	ANDERSON	PLANNING		SCHULTZ	$0	$0
UT05.101	8RD0717H	MITIGATE QUEUE LENGTHS IN WORK ZONE TRAFFIC CONTROL	LEONARD	CONSTRUCTION	$18,000	SAITO	$0	$0
UT05.206	8RD0718H	SKID INDEX TRIGGER VALUES	ANDERSON	PROGRAM DEVELOPMENT	$10,000	LAWRENCE	$1,240	$0
AM06.004	8RD0719H	TARGETED & ADAPTIVE SIMULATOR TRAINING FOR WINTER MAINTENANCE	LINDSEY / ANDERSON	MAINTENANCE	$77,011	STRAYER	$20,000	$33,358
AM06.003	8RD0720H	DETERMINATION OF CRASH COSTS FOR USE IN BENEFIT/COST ANALYSIS (VALUE OF LIFE)	ANDERSON	ADMINISTRATIVE	$9,900	PERRIN	$6,370	$0
AM06.005	8RD0721H	OLDER DRIVER STUDY: EVALUATION OF SAFETY EFFECTS OF PAVEMENT MARKINGS AND SIGNAGE	LINDSEY	ADMINISTRATIVE		SAITO	$12,000	$6,000
AM06.006	8RD0722H	PAVEMENT MARKINGS STUDY (TEST SECTIONS)	LINDSEY	ADMINISTRATIVE	$15,000	IN-HOUSE	$8,000	$7,000
UT05.510	8RD0723H	ASSET MANAGEMENT SYSTEM, IMPLEMENT MAINTENANCE FEATURES (GOOD ROADS COST LESS)	WAKIL	MAINTENANCE	$280,000	ZAVISKI	$170,000	$123,800
UT05.4X1	8RD0724H	WATER RESOURCES INVESTIGATION	FAZIO	HYDRAULICS	45,000	LAMBERT	$33,000	$0
UT01-401B	8RD0725H	ADAPTIVE SIGNAL CONTROL PHASE 5	LINDSEY	TRAFFIC & SAFETY	45,000	MARTIN	$20,000	$25,000
						TOTAL:	$306,807	$195,158

New Projects

The 19 projects selected from the UTRAC Workshop prioritization lists for funding, plus two projects specified for funding by UDOT's senior leaders, constitute the new projects to be funded during fiscal year 2007. The 14 new projects to be funded with SPR funds are listed in Table 5, and the seven to be funded with State funds are listed in Table 6. These tables also present data indicating the Research Project Manager, the Principal Investigator, the Division of UDOT being served by the project, and various tracking numbers. The research objectives of each of these new UTRAC-generated projects are described on "Problem Statement" forms included in Appendix C to this document.

The budget for FY 2007, and the anticipated budget for FY 2008 are shown for each project. Note that the projected budgets for FY 2007 and FY 2008 do not equal the preliminary budget amount because some expenditures might be projected beyond FY 2008, and non-contract costs, such as overhead and management costs are included in the FY2007 and FY2008 budget figures. The total budget figures, shown at the bottom of the tables, is reflected on the FY 2007 budget sheet described in the next section.

Pooled Fund Projects

The ten Pooled Fund projects that UDOT is participating in at the beginning of FY 2007 are shown in Table 7. Some of these projects are on-going, and others are new during this fiscal year. UDOT is the lead state in four of these projects, as shown on the table. In the other six, UDOT is participating in a non-lead role.

Completed Projects

During fiscal year 2006, 22 federally funded and 19 state funded projects were completed. A list of these federally funded projects is given in Table 8, and the state funded projects in Table 9, along with pertinent information about each project.

TABLE 5: NEW SPR-FUNDED PROJECTS

PROJECT ID CODE (PIC)	FY07 PROJECT #	DESCRIPTION	PM	DIVISION	ORIG. BUDGET	PI	FY07 BUDGET	FY08 BUDGET
UT06.206	5H05439H	EVALUATION OF OVERLAY RUTTING SUSCEPTIBILITY (9 MM ASPHALT VS. 12.5MM ASPHALT)	SHARP	MATERIALS	$35,000	GUTHRIE	$32,550	$14,000
UT06.306	5H05440H	VALIDATE HAMBURGH WHEEL TRACKER USING FIELD TESTED SUPERPAVE MIXES	ANDERSON	MATERIALS	$60,000	ROMERO	$65,100	$32,500
UT06.404	5H05441H	DEVELOPMENT OF A HABITAT QUALITY INDEX	FAZIO	ENVIRONMENTAL	$210,000	TWEDT	$89,900	$65,100
UT06.506	5H05442H	SEISMIC VULNERABILITY AND EMERGENCY RESPONSE OF UDOT LIFELINES	LEONARD	PLANNING	$80,000	BARTLETT	$96,875	$50,375
UT06.603	5H05443H	SAFETY ANALYSIS OF FATIGUE AND DROWSY DRIVING	ANDERSON	TRAFFIC & SAFETY	$71,000	SCHULTZ	$48,050	$16,400
UT06.706	5H05444H	STONE COLUMN TREATMENT WITH WICK DRAINS IN SILTY SANDS	LEONARD	GEOTECHNICAL	$30,000	ROLLINS	$51,150	$0
UT06.801	5H05445H	EVALUATION OF BRIDGES FOR SEISMIC RETROFIT	HSIAO	STRUCTURES	$120,000	RYAN	$95,583	$49,084
UT06.901	5H05446H	FISH PASSAGE AT UTAH CULVERTS: STRATEGY,ASSESSMENT, AND DESIGN.	FAZIO	HYDRAULICS	$74,166	HOTCHKISS	$70,525	$48,825
UT06.201	5H05447H	INSTALL AVALANCHE MONITORING SYSTEM	WAKIL	MAINTENANCE	$100,000		$97,650	$66,650
UT06.710	5H05448H	DEVELOPMENT OF MSE WALL INSPECTION PLAN BASED ON FAILURE MODE ANALYSIS AND RISK ASSESSMENT	LEONARD	GEOTECHNICAL	$40,000	BAY	$26,350	$21,850
UT06.705	5H05449H	IMPROVED PERFORMANCE OF MSE WALLS	LEONARD	GEOTECHNICAL	$25,000	GERBER	$25,188	$17,437
UT06.902	5H05450H	ESTIMATING PEAK FLOW STATISTICS FOR UNGAGED STREAMS, PHASE 2)	FAZIO	HYDRAULICS	$35,000	LAMBERT	$41,850	$19,700
UT06.802	5H05451H	CALIBRATION OF AASHTO'S NEW PRESTRESS LOSS DESIGN EQUATIONS	HSIAO	STRUCTURES	$44,621	BARR	$74,038	$66,000
AM07.001	5H05452H	FREEWAYS TO FUEL: A NOVEL APPROACH TO BIOFUELS PRODUCTION	WAKIL	PROJECT DEVELOPMENT		WHITESIDES	$53,475	$34,875
					TOTAL:		$868,284	$502,796

TABLE 6: NEW STATE-FUNDED PROJECTS

PROJECT ID CODE (PIC)	FY07 PROJECT #	DESCRIPTION	PM	DIVISION	ORIG. BUDGET	PI	FY07 BUDGET	FY08 BUDGET
UT06.602	8RD0729H	EVALUATION OF THE SAFETY AND DESIGN IHSDM BY FHWA	ANDERSON	TRAFFIC & SAFETY	47,700	SAITO	$41,463	$37,897
UT06.507	8RD0731H	CALIBRATION AND VALIDATION OF I-15 VISSIM MODEL	LINDSEY	TRAFFIC & SAFETY	$30,000	MARTIN	$25,575	$25,575
UT06.102	8RD0726H	QUALITY AND SAFETY DURING NIGHTTIME CONSTRUCTION ACTIVITIES	HSIAO	CONSTRUCTION	$10,000		$17,825	$0
UT06.703	8RD0727H	ASSESSMENT OF MUD BALANCE TEST FOR QUALITY ASSURANCE IN GROUND ANCHOR INSTALLATION	LEONARD	GEOTECHNICAL	$4,000	FARNSWORTH	$7,750	$0
UT06.103	8RD0728H	GIS PROJECT TRACKING WEBSITE	BERG	PLANNING & ASSET MAN	$95,000		$44,175	$110,825
UT06.302	8RD0730H	ASSET IMPROVEMENT TRACKING – (CONSTRUCTION HISTORY)	ANDERSON	CONSTRUCTION	$30,000		$17,825	$0
AM06.007	8RD0735H	EXPRESS LANE GENETIC ALGORITHM MODEL AND EVALUATION	LINDSEY	TRAFFIC	$122,000	MARTIN	$48,567	$127,660
						TOTAL:	$203,180	$301,957

TABLE 7: POOLED FUND PROJECTS

PROJECT ID CODE (PIC)	FY07 PROJECT #	DESCRIPTION	PM	DIVISION	ORIG. BUDGET	PI	FY07 BUDGET	FY08 BUDGET
NON-LEAD STATE POOLED FUND PROJECTS								
PL02.207		TRANSPORTATION MANAGEMENT CENTER	LINDSEY	TOC	$50,000	FHWA	$25,000	$25,000
PL05.046		TRANSPORTATION CURRICULUM COORDINATION TPF-5(046)			$0	FHWA	$0	$0
PL05.097	4200501D	EVALUATION OF THE SAFETY EDGE TPF-5(097)		TRAFFIC & SAFETY	$15,000		$15,000	
PL05.064	5104701D	WESTERN ALLIANCE FOR QUALITY TRANSPORTATION TPF-5(064)		MATERIALS	$10,000		$10,000	
PL05.068		LONG TERM MAINT OF LOAD AND RESISTANCE FACTOR DESIGN SPECS TPF-5(068)		ENG SERVICES	$20,000		$20,000	$20,000
PL06.042		AURORA PROJECT (SPR-3(042))			$25,000		$25,000	
						TOTAL:	**$95,000**	**$45,000**
LEAD STATE POOLED FUND PROJECTS								
PL05.145	Note 1	WESTERN MAINTENANCE PARTNERSHIP		MAINTENANCE	$0	UTAH		
PL02.094	4001808H	PAVEMENT MARKING LIFE CYCLE PH. 2	BERG	MAINTENANCE	$320,000	BECK	$10,000	$50,000
PL05.017	5084301D	WASHTO-X VIDEO CONFERENCING TECHNOLOGY TR. PH.2	ANDERSON	TECHNOLOGY TRANSFER	$100,000	DOYT BOLLING	$35,000	$40,000
PL05.122	Note 2	DYNAMIC PASSIVE PRESSURE ON ABUTMENTS AND T	HSIAO	STRUCTURES / GEOTECH		ROLLINS		
						TOTAL:	**$45,000**	**$90,000**

Note 1: See UT05.703 under Continuing SPR-Funded Projects
Note 2: See UT05.703 under Continuing SPR-Funded Projects

TABLE 8: COMPLETED FEDERAL-FUNDED PROJECTS

PROJECT ID CODE (PIC)	JOB/PROJ NUMBER	DESCRIPTION	PM	DIVISION	ORIG. BUDGET	CONTRACT INFO				
						NUMBER	AMOUNT	EXP. TO DATE	VENDOR NAME	PI
INNOVATIVE BRIDGE										
AM06.001	81SR0516	SURVEY SERVICE AT 4700 S 5600 W INTERSECTION FOR RAILROAD AND UTILITY GROUP	HSIAO	ADMINISTRATIVE	$22,000	05-9242	$17,250.00	$17,250.00	RAPPID MAPPER	ALGARIN
IB04.001	81FB0851	R-2, I-215 OVER 3760 S & 3900 S	HSIAO	STRUCTURES	$55,000	04-9103	$34,800.00	$33,150.00		DYE
MP01.001	5036515D	2 LOC ON I-80 (I-80 FRP RETROFIT, ON STATE ST)	HSIAO	STRUCTURES	$600,000	01-9203	$70,500.00	$510,074.76	U OF U	PANTELIDES
I-15 NATIONAL TEST BED										
TB02.001	81F15303	LONG TERM STRUCTURAL MONITORING OF POST TENSIONED SPLICED GIRDERS AND DECK JOINTS	HSIAO	STRUCTURES		02-9166		$194,500.00	U OF U	PANTELIDES
TB01.406	81F15406	FRP COMP RECT CONCRETE COLUMNS	HSIAO	STRUCTURES	$151,000	03-9056	$161,924.00	$161,924.00	U OF U	PANTELIDES
LTAP PROGRAM										
MP03.002	5098815D	FY03 LTAP ANNUAL CONTRACT	BERG	PROGRAM	$280,000	03-8652	$560,000.00	$559,999.99	USU	BOLLING
SPR-FUNDED PROJECTS										
AM00.001	81FR0364	ASSESS USER IMPACTS OF FAST TRACK CONTRACTING-PH 2	ANDERSON	CONSTRUCTION	$35,000	04-9019	$30,000.00	$30,000.00	U OF U	MARTIN
AM02.001	81FR0232	CONDITION OF EXIST HWY CULVERTS-*IMPLEMENTATION*	LEONARD	HYDRAULICS		03-9097	$156,733.00	$156,733.00	SIMPSON GUMPERTZ &	MCGRATH
TB00.308	81FR0592	MONITOR MSE WALLS	LEONARD	GEOTECHNICAL		CANCELLED	$40,000.00	$0.00	USU	BAY
UT01.301	81FR0214	DEVELOP UTAH WETLAND FUNCTIONAL ASSESSMENT METHOD	LEONARD	ENVIRONMENTAL	$55,000	04-9044	$50,930.00	$50,930.00	USU	JOHNSON
UT01.306	81FR0215	HYDRODYNAMIC SEPARATORS AS STORMWATER BEST MANAGEMENT PRACT.	WAKIL	HYDRAULICS	$55,000	04-9130	$49,525.97	$49,525.97	STANTEC	NICHOLS
UT01.503	81FR0212	INVESTIGATION OF BRIDGE DECK SLAB CRACKING ON NEW I-15 BRIDGES	AVILA	STRUCTURES	$55,000	03-9105	$49,786.00	$49,786.00	U OF U	PANTELIDES
UT01.504	81FR0210	BRIDGE DECK STRATEGY	HSIAO	STRUCTURES	$30,000	03-9192	$45,362.00	$45,362.00	BYU	GUTHRIE
UT02.101	81FR0344	ADVANCED SIMULATOR TRAINING FOR WINTER MAINTENANCE	LINDSEY	MAINTENANCE	$100,000	03-9134	$219,493.00	$219,493.00	U OF U	STRAYER
UT02.204	81FR0343	UDOT TRAFFIC DATA & (AASHTO) DESIGN TRAFFIC DATABASE	ANDERSON	MATERIALS	$155,000	03-9185	$163,378.50	$146,363.69	ERES CONSULTANTS	DARTER
UT02.401	81FR0341	EVALUATION OF TRAFFIC & SAFETY INITIATIVES	LINDSEY	TRAFFIC & SAFETY	$90,000	03-9153	$132,302.00	$83,000.00	BYU	SAITO
UT02.501	81FR0342	PRIORITIZATION OF IMPORTANT ROUTES (CRITICAL LIFELINES)	BERG	STRUCTURES	$30,000			$0.00		
UT03.301	81FR0513	IMPACTS OF RAISED MEDIANS (05-8439)	LINDSEY	TRAFFIC & SAFETY,	$70,000	05-8439	$54,853.53	$43,827.88	PENNA POWERS	
UT03.402	81FR0510	DEVELOPMENT OF ROAD USER-COST EST. PROCEDURES/UDOT	ANDERSON	CONSTRUCTION	$40,000	04-9090	$35,000.00	$35,000.00	BYU	SAITO
UT05.303	81FR0641	SMA PAVING MECHANISTIC PROPERTIES	ANDERSON	MATERIALS	146,606				ERES CONSULTANTS	DARTER
UT05.507	81FR0622	EXTRACT VEHICLE CLASSIFICATION FROM TOC VIDEO	ANDERSON	TRAFFIC & SAFETY	$73,077	04-9007			USU COMP SCI	CHENG
UT99.105	81FR0031	INNOVATIVE CONTRACTING METHODS	BERG	PROJECT DEVELOPMENT	$60,000	01-9112	$49,302.00	$49,302.00	USU	BOLLING
	81FR0530	R-2 LONG LINE PAVEMENT MARKING TEST DECK	PAGE	MAINTENANCE		N/A - IAT TO R-2		$35,215.54		

TABLE 9: COMPLETED STATE-FUNDED PROJECTS

PROJECT ID CODE (PIC)	JOB/PROJ NUMBER	DESCRIPTION	PM	DIVISION	ORIG. BUDGET	CONTRACT INFO				
						NUMBER	AMOUNT	EXP. TO DATE	VENDOR NAME	PI
AM06.001	81SR0516	EVALUATION OF RAPPID MAPPER TECHNOLOGY	HSIAO		$42,000	IAT				
MPC05.001	81SR0510	ADAPTIVE SIGNAL CONTROL IMPLEMENTATION & EVALUATION	LINDSEY	TRAFFIC & SAFETY	$40,000	05-9116		$0.00	U OF U	MARTIN
MPC05.002	81SR0510	EFFECTIVENESS OF HOV LANES, PH 3	LINDSEY	TRAFFIC & SAFETY	$29,000	05-9116	$100,000.00	$100,000.00	U OF U	MARTIN
MPC05.003	81SR0510	ADVANCE TRAVELER INFORMATION SYSTEMS (ATIS)	LINDSEY	TRAFFIC & SAFETY	$45,000	05-9116			U OF U	MARTIN
MPC05.004	81SR0510	UTAH INTERSECTION SAFETY	LINDSEY	TRAFFIC & SAFETY	$45,000	05-9116			U OF U	COTTRELL
TB00.309	81S15309	CORROSION EVALUATION OF STEEL PIPE PILES(I-15)	LEONARD	GEOTECHNICAL	$43,600	03-9073	$43,600.00	$7,200.00	BYU	ROLLINS
TB00.310	81S15310	LATERAL LOADS ON PILE GROUPS, PH 4	LEONARD	GEOTECHNICAL	$38,700	03-9012	$88,700.00	$29,000.00	BYU	ROLLINS
TB01.410	81SR0330	I-15 TESTBED PROGRAM DEVELOPMENT	LEONARD	GEOTECHNICAL		MISC				
UT00.503	81SR0123	EVAL SHELBY VS PISTON SAMPLERS & MONITOR MSE WALLS	LEONARD	GEOTECHNICAL	$60,200	01-9118	$251,000.00	$125,500.00	USU	BAY / ANDERSON
UT01.401	81SR0442	ADAPTIVE SIGNAL CONTROL, PH 3	LINDSEY	TRAFFIC & SAFETY	$40,000	04-9018	$35,000.00	$35,000.00	U OF U	PETER MARTIN
UT01.402	81SR0341	CRASH DATA INFO. MANAGEMENT USING GIS, PH 2	ANDERSON	TRAFFIC & SAFETY	$11,000	03-9041	$7,949.60	$6,950.50	IWORQ	PERRETT
UT01.405	81SR0443	EFFECTIVENESS OF HOV LANES, PH 2	BURNS	TRAFFIC & SAFETY	$29,000	04-9018	$25,000.00	$25,000.00	U OF U	MARTIN
UT02.301A	81SR0350	DISCHARGE RECALCULATIONS PHASE II, IDF CURVE DATA	HSIAO	HYDRAULICS	$30,000	04-9123	$20,498.00	$20,498.00	USU	GRENNEY
UT02.301B	81SR0441	HYDRAULIC DISCHARGE CALCS PH 2 (Canyons)	HSIAO	HYDRAULICS	$50,000	04-9029	$42,500.00	$42,500.00	U OF U	PERRICA
UT02.403B	81SR0360	SMART PDA-VAN INSTRUMENTATION	ANDERSON	MATERIALS	$32,000	03-9189	$39,335.00	$29,720.70	SAMSUNG SDS AMERICA	DENNIS
UT03.403	81SR0444	VIDEO DETECTION FIELD TEST	LINDSEY	TRAFFIC & SAFETY	$45,000	04-9018	$40,000.00	$40,000.00	U OF U	MARTIN
UT05.103	81SR0626	WORKER VISIBILITY	PAGE	CONSTRUCTION	$19,135	06-9026	$ 19,135.00	$19,135.00	U OF U	COTTRELL
UT95.102	81D00033	EVAL. SEAL COAT DATA (LIFE OF PRESERVATION SEALS)	ANDERSON	MAINTENANCE	$25,311	03-9053	$25,311.00	$25,311.00	U OF U	ROMERO
UT97.542	81SR0291	UTAH ROCKFALL HAZARD RATING SYSTEM & MAINTENANCE MANAGEMENT PROGRAM, PHASE II, PART 2 (FINAL EVALUATION)	LEONARD	GEOTECHNICAL	$100,000	04-9072	$40,000.00	$93,986.26	USU	PACK

RESEARCH DIVISION FY07 BUDGET

The budget for the UDOT Research Division is shown in Table 10. This budget consists of revenues from Federal and State sources, as described above, and disbursements to continuing research projects and new research projects, also as described above. In addition, disbursements are made to support various cooperative programs, such as the AASHTO Technology Implementation Group (TIG), the Transportation Research Board (TRB), the AASHTO National Transportation Product Evaluation Program (NTPEP), the National Cooperative Highway Research Program (NCHRP), the FHWA Peer Exchange, LTAP, pooled fund projects, and Experimental Features projects. Each of these is shown on the budget.

The budget shown in Table 10 is divided into the Federal programs and the State programs. The Federal fiscal year begins on October 1, and the Utah State fiscal year begins on July 1. State funds used to match federal funds are shown under the "Federal Program" portion of the budget, since these are required funding matches.

The Research Division incurs overhead costs from personnel salary and benefits, building overhead, office supplies and materials, and travel costs. These overhead costs for fiscal year 2007 are estimated to be as follows:

Personal Services Overhead:	$ 685,694.
Office and Travel Overhead:	$ 123,300.

These overhead amounts do not show up in the budget as separate line items. Overhead costs are applied directly to each individual research project, based proportionally on direct contract and labor costs spent on the projects. For budgetary purposes, direct contract and labor costs are increased by 55 percent to account for this overhead charge. This amount is based on the overhead costs applied to projects during the previous year. Actual overhead allocations for each project are calculated at the end of the fiscal year. The budgets shown on Table 10 for the continuing and new research projects have the overhead allocations included in the figures.

TABLE 10: RESEARCH BUDGET - FY 2007

	REVENUE	DISBURSEMENTS	NET
FEDERAL PROGRAM			
State Planning and Research (SPR) - FY 07 (L560)	$ 1,230,719.00		
Utah Construction Fund (20% match for FY07 SPR)	$ 307,680.00		
State Planning and Research (SPR) - FY 06 Unobligated (L560)	$ 665,766.25		
Utah Construction Fund (20% match for FY06 SPR)	$ 166,441.56		
State Planning and Research (SPR) - FY06 Obligated Unspent	$ 186,980.46		
Other SPR Carryover (Mandatory 25% Studies - HPR, O860)	$ 23,474.42		
Other SPR Carryover (Mandatory 25% Studies - HPR-TEA21, Q560)	$ 2,029.92		
Res Study Nondestructive Testing (I-15 Ph 4)	$ 35,804.83	$ 89,233.00	
FY07 Local Technical Assist Program (LTAP)	$ 112,500.00	$ 225,000.00	
Utah Construction Fund (50% match for FY07 LTAP)	$ 112,500.00		
Product Demonst. Showcase (LTAP PDS) - FY06 Obligated Unspen	$ 75,000.00	$ 75,000.00	
Continuing Research Projects - FY07 costs		$ 905,892.00	
New Research Projects (UTRAC & other) - FY07 costs		$ 868,284.17	
USU Univ Transportation Center - matching funds	$ 52,000.00		
Pooled Fund Contributions - Non-Lead State		$ 95,000.00	
Pooled Fund Contributions - Lead State		$ 45,000.00	
New Requests / Project Extensions / Scope Changes		$ 293,000.00	
TIG		$ 5,000.00	
TRB		$ 87,565.00	
NTPEP		$ 6,000.00	
NCHRP		$ 270,758.00	
FHWA Peer Exchange		$ 5,000.00	
Subtotal:	**$ 2,970,896.44**	**$ 2,970,732.17**	**$ 164.27**
STATE PROGRAM			
State Administration	$ 520,000.00		
Continuing Research Projects - FY07 costs		$ 306,807.00	
New Research Projects (UTRAC & other) - FY07 costs		$ 203,179.17	
Experimental Features Projects		$ 10,000.00	
Subtotal:	**$ 520,000.00**	**$ 519,986.17**	**$ 13.83**

Appendix A

Program Certification Documents

State of Utah

JON M. HUNTSMAN, JR.
Governor

GARY R. HERBERT
Lieutenant Governor

DEPARTMENT OF TRANSPORTATION

JOHN R. NJORD, P.E.
Executive Director

CARLOS M. BRACERAS, P.E.
Deputy Director

CERTIFICATION OF COMPLIANCE

I, Rukhsana Lindsey, Director of Research and Bridge Operations, State of Utah Department of Transportation, do hereby certify that the State of Utah is in compliance with all requirements of 23 U.S.C. 505 and its implementing regulations with respect to the research, development, and technology transfer program, and contemplate no changes in statutes, regulations, or administrative procedures which would affect such compliance.

for Rukhsana Lindsey, Director of Research and Bridge Operations

15 MAY 2007
Date

Calvin L. Rampton Complex, 4501 South 2700 West, Salt Lake City, Utah 84119-5998
telephone 801-965-4000 • facsimile 801-965-4338 • www.udot.utah.gov

U.S. Department of Transportation
Federal Highway Administration

UTAH DIVISION

2520 West 4700 South, STE 9A
Salt Lake City, UT 84118-1880

May 21, 2007

In Reply Refer To:
HDA-UT

Ms. Rukhsana Lindsey
Utah Department of Transportation
4501 South 2700 West
Salt Lake City, UT 84114-8410

Subject: Approval of 2007 Research Work Program

Dear Ms. Lindsey:

Our office has reviewed the 2007 Research Work Program submitted on May 16, 2007. Based on our review the work program is approved. This work program nullifies all previous work programs and outlines those projects and activities that are authorized to start in Federal Fiscal Year 2007 or continue from previous work programs during FFY 2007. This work program will end on September 30, 2007. Please ensure that the Federal Fiscal Year 2008 work program is submitted to this office before September 15, 2007 to ensure that our office will have time to review and approve the work program prior to the beginning of the fiscal year which is October 1, 2007.

Sincerely Yours,

Todd A. Emery
Program Quality Engineer

Cc: (electronic copy only)
Michael Fazio, UDOT Research
Blaine Leonard, UDOT Research

MOVING THE AMERICAN ECONOMY

Appendix B

Status of Research Projects

FY06 Research Projects: Status Report

I-15 TESTBED

LOAD RATE ON AXIAL & LATERAL PILE CAPACITY

PIC: **TB01.401**	PROJECT NO: **5073501D**	JOB NO: **81F15401**	CONTRACT NO: **03-9144**
STATUS (PERCENT COMPLETE): **80%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **JENSEN, KYLE ROLLINS**
START DATE: **10/1/2002**	END DATE: **3/31/2006**	ESTIMATED COST: **$155,586**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **JON BISCHOFF**	DIVISION: **GEOTECHNICAL**		
DELIVERABLE: **Deliverable: Pile Design Recommendations.**			
SCHEDULE STATUS: **Behind schedule**			

EVALUATION OF FIBER REINFORCED POLYMER (FRP) COMPOSITE RETROFIT OF RECTANGULAR CONCR

PIC: **TB01.406**	PROJECT NO: **5073501D**	JOB NO: **81F15406**	CONTRACT NO: **03-9056**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **CHRIS PANTELIDES**
START DATE: **9/3/2002**	END DATE: **8/31/2005**	ESTIMATED COST: **$161,924**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **NATIONAL STUDY**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Report complete, on disk (not published)**			
SCHEDULE STATUS: **Done**			

CONSOLIDATION & DRAINAGE PROPERTIES OF SOFT SOILS

PIC: **TB01.407**	PROJECT NO: **5073501D**	JOB NO: **81F15407**	CONTRACT NO: **03-9066**
STATUS (PERCENT COMPLETE): **90%**	PROJECT MANAGER: **KEN BERG**		PRINCIPAL INVESTIGATOR: **BARTLETT**
START DATE: **8/5/2002**	END DATE: **12/31/2004**	ESTIMATED COST: **$144,000**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **KEITH BROWN**	DIVISION: **GEOTECHNICAL**		
DELIVERABLE: **Draft Final Report UT-04.20 awaiting publication**			
SCHEDULE STATUS: **Complete, close contract**			

I-15 TESTBED TECHNOLOGY TRANSFER

PIC: **TB01.409**	PROJECT NO: **5073501D**	JOB NO: **81F15409**	CONTRACT NO: **IN HOUSE**
STATUS (PERCENT COMPLETE): **75%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **N/A**
START DATE: **6/1/2003**	END DATE: **6/30/2006**	ESTIMATED COST: **$55,000**	UNIVERSITY/CONSULTANT: **N/A**
CHAMPION: **RESEARCH**	DIVISION: **GEOTECHNICAL**		
DELIVERABLE: **Implementation Symposium; Deliverable: Workshop & Training**			
SCHEDULE STATUS: **Keep Open**			

LONG TERM STRUCTURAL MONITORING OF POST TENSIONED SPLICED GIRDERS AND DECK JOINTS

PIC: **TB02.001**	PROJECT NO: **5073501D**	JOB NO: **81F15303**	CONTRACT NO: **02-9166**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **CHRIS PANTELIDES**
START DATE: **8/1/2001**	END DATE: **6/30/2006**	ESTIMATED COST: **$194,500**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **BOYD WHEELER**	DIVISION: STRUCTURES		
DELIVERABLE: **Interim Report complete, scope finished.**			
SCHEDULE STATUS: **Done**			

INNOVATIVE BRIDGE

USING MMFX REBAR & HPS PERFORMANCE

PIC: **IB01.001**	PROJECT NO: **5076608H**	JOB NO: **N/A**	CONTRACT NO: **05-9263**
STATUS (PERCENT COMPLETE): **25%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **BARR**
START DATE: **5/16/2005**	END DATE: **6/30/2007**	ESTIMATED COST: **$40,600**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **BOYD WHEELER**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Literature Search Underway, will include summary of existing research**			
SCHEDULE STATUS **0**			

STAINLESS CLAD REBAR RT 79 MP2 WEBER CO.

PIC: **IB02.001**	PROJECT NO: **5067601D**	JOB NO: **81FB0676**	CONTRACT NO: **02-9195**
STATUS (PERCENT COMPLETE): **90%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **PAUL CARTER**
START DATE: **7/1/2001**	END DATE: **12/31/2006**	ESTIMATED COST: **$77,260**	UNIVERSITY/CONSULTANT: **EARTH TECH**
CHAMPION: **BOYD WHEELER**	DIVISION: **STRUCTURES**		
DELIVERABLE: **0**			
SCHEDULE STATUS **Site visit to N Carolina plant is final task - timing unknown**			

I-80; CO. RD OVER I-80 1.9 M. E. OF WANSHIP (PRECAST DECK)

PIC: **IB03.001**	PROJECT NO: **5090108H**	JOB NO: **81FB0901**	CONTRACT NO: **03-9177**
STATUS (PERCENT COMPLETE): **70%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **CARMEN LARREA**
START DATE: **2/1/2003**	END DATE: **12/31/2007**	ESTIMATED COST: **$265,133**	UNIVERSITY/CONSULTANT: **URS**
CHAMPION: **TODD JENSEN**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Scanning Tour to New York & New Jersey, lessons learned report given to Champions**			
SCHEDULE STATUS **more workshops, scanning tours planned**			

R-2, I-215 OVER 3760 S & 3900 S

PIC: **IB04.001**	PROJECT NO: **5085108H**	JOB NO: **81FB0851**	CONTRACT NO: **04-9103**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **DELOY DYE**
START DATE: **1/1/2003**	END DATE: **7/1/2005**	ESTIMATED COST: **$34,800**	UNIVERSITY/CONSULTANT: **DELOY DYE**
CHAMPION: **BOYD WHEELER**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Report distributed to structures designers. Seminar held in each Region.**			
SCHEDULE STATUS **Done, can close**			

*2 LOC ON I-80 (I-80 FRP RETROFIT, ON STATE ST)

PIC: **MP01.001**	PROJECT NO: **5036515D**	JOB NO:	CONTRACT NO: **01-9203**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **CHRIS PANTELIDES**
START DATE: **7/1/2001**	END DATE: **12/1/2004**	ESTIMATED COST: **$600,000**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **BOYD WHEELER**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Completed**			
SCHEDULE STATUS **0**			

ADMINISTRATIVE

USER IMPACT PROGRAM: EVALUATING DESIGN-BUILD CONTRACTING METHODS FOR STIP PROJECTS 20

PIC: **AM05.002**	PROJECT NO: **N/A**	JOB NO: **81FR0646**	CONTRACT NO: **05-9153**
STATUS (PERCENT COMPLETE): **60%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **PETER MARTIN**
START DATE: **3/1/2005**	END DATE: **9/30/2007**	ESTIMATED COST: **$74,999**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **REGION DIRECTORS; BOB WEST**	DIVISION: **CONSTRUCTION**		
DELIVERABLE: **Traffic Model of User Impacts, various projects, Report UT-05.15 (I-15 NOW)**			
SCHEDULE STATUS **On Schedule**			

LEAD POOLED FUND STUDY

SPR-3(094): PAVEMENT MARKING LIFE CYCLE PH 2

PIC: **PL02.094**	PROJECT NO: **4001808H**	JOB NO: **N/A**	CONTRACT NO: **03-9184**
STATUS (PERCENT COMPLETE): **60%**	PROJECT MANAGER: **KEN BERG**		PRINCIPAL INVESTIGATOR: **BECK**
START DATE: **9/1/2002**	END DATE: **6/30/2006**	ESTIMATED COST: **$319,944**	UNIVERSITY/CONSULTANT: **BC TRAFFIC**
CHAMPION: **SHANA LINDSEY**	DIVISION: **MAINTENANCE**		
DELIVERABLE: **Life Cycle Curves on Pavement Marking (Report)**			
SCHEDULE STATUS **0**			

TPF-5(017): WASHTO-X VIDEOCONFERENCING TECHNOLOGY TRANSFER PROGRAM PHASE 2

PIC: **PL05.017**	PROJECT NO: **5084301D**	JOB NO: **5084301D**	CONTRACT NO: **06-9134**
STATUS (PERCENT COMPLETE): **ONGOING**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **DOYT BOLLING**
START DATE: **1/1/2006**	END DATE: **6/30/2008**	ESTIMATED COST: **$100,000**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **ABDUL WAKIL**	DIVISION: **TECHNOLOGY TRANSFER**		
DELIVERABLE: **Deliverable is workshops, LTAP posts proceedings on Web**			
SCHEDULE STATUS **On Schedule**			

TPF-5(122): DYNAMIC PASSIVE PRESSURE ON ABUTMENTS & PILE CAPS

PIC: **UT05.703**	PROJECT NO: **H005408H**	JOB NO: **81FR0624 81PF6950**	CONTRACT NO: **06-9148**
STATUS (PERCENT COMPLETE): **15%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **KYLE ROLLINS**
START DATE: **5/1/2005**	END DATE: **6/30/2009**	ESTIMATED COST: **$210,000**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **JON BISCHOFF TODD JENSEN**	DIVISION: **GEOTECHNICAL**		
DELIVERABLE: **0**			
SCHEDULE STATUS **on schedule**			

AURORA PROGRAM SPR-3(042) -UDOT WEATHER OPERATIONS / RWIS PROGRAM PHASE I AT UDOT

PIC: **PL06.042**	PROJECT NO:	JOB NO:	CONTRACT NO: **06-9086**
STATUS (PERCENT COMPLETE):	PROJECT MANAGER: DOUG ANDERSON		PRINCIPAL INVESTIGATOR: **XIANMING SHI**
START DATE: **10/1/2005**	END DATE: **7/31/2007**	ESTIMATED COST: **$25,000**	UNIVERSITY/CONSULTANT: **MONTANA STATE UNIVERSITY**
CHAMPION: **DAVE KINNECOM / RALPH PATT**	DIVISION: **TOC**		
DELIVERABLE: **TOC COMMITTED TO A $25,000 FUND MATCH, PER DAVE KINNECOM**			
SCHEDULE STATUS **0**			

POOLED FUND STUDY

SPR-2(174): ACCELERATED PAVEMENT TESTING OF CRUMB RUBBER MODIFIED ASPHALT PAVEMENTS

PIC: **PL02.174**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE):	PROJECT MANAGER:		PRINCIPAL INVESTIGATOR:
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION:		
DELIVERABLE: **Cleared by FHWA**			
SCHEDULE STATUS **0**			

SPR-2(207): TRANSPORTATION MANAGEMENT CENTER POOLED FUND STUDY

PIC: **PL02.207**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE):	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **FHWA**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION: **DAVE KINNECOM**	DIVISION: **TOC**		
DELIVERABLE: **$25K Committed; $25K FY06-08**			
SCHEDULE STATUS **0**			

SPR-2(800): SHRP IMPLEMENTATION ASPHALT TEST

PIC: **PL02.800**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE):	PROJECT MANAGER:		PRINCIPAL INVESTIGATOR:
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION:		
DELIVERABLE: **Cleared by FHWA**			
SCHEDULE STATUS **0**			

SPR-3(039): DEMONSTRATION AND EVALUATION OF ITS TECHNOLOGY FOR THE RURAL HIGHWAY ENVIR

PIC: **PL03.039**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE):	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **MONTANA**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION: **DAVE KINNECOM**	DIVISION: **TOC**		
DELIVERABLE: **$10K FY06-07**			
SCHEDULE STATUS **0**			

SPR-3(090): NATIONAL SCIENCE FOUNDATION INFRASTRUCTURE DURABILITY INITIATIVE

PIC: **PL03.090**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE):	PROJECT MANAGER:		PRINCIPAL INVESTIGATOR:
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION:		
DELIVERABLE: **Cleared by FHWA**			
SCHEDULE STATUS **0**			

POOLED FUND STUDY (Continued . . .)

SPR-3(091): DEVELOPMENT OF THE ADVANCED ROTARY PLOW (ARP) FOR SNOW REMOVAL OPERATIONS

PIC: **PL03.091**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE):	PROJECT MANAGER:		PRINCIPAL INVESTIGATOR:
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION:		
DELIVERABLE: **Contract Signed**			
SCHEDULE STATUS **0**			

SPR-3(095): ESTABLISHMENT OF A PROGRAM TO SUPPORT THE RESEARCH, DEVELOPMENT, AND DEPLOY

PIC: **PL03.095**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE):	PROJECT MANAGER:		PRINCIPAL INVESTIGATOR:
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION:		
DELIVERABLE: **Cleared by FHWA**			
SCHEDULE STATUS **0**			

SPR-3(099): TEL8 TELECOMMUNICATIONS SYSTEM

PIC: **PL03.099**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER:		PRINCIPAL INVESTIGATOR:
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION:		
DELIVERABLE: **Cleared by FHWA**			
SCHEDULE STATUS **0**			

TPF-5(015): THE EROSION CONTROL LABORATORY

PIC: **PL05.015**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE): **95%**	PROJECT MANAGER:		PRINCIPAL INVESTIGATOR:
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION:		
DELIVERABLE: **Contract Signed**			
SCHEDULE STATUS **0**			

TPF-5(046): TRANSPORTATION CURRICULUM COORDINATION COUNCIL (TCCC) TRAINING MANAGEMENT

PIC: **PL05.046**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE):	PROJECT MANAGER:		PRINCIPAL INVESTIGATOR: **FHWA**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION:		
DELIVERABLE: **Cleared by FHWA; $20K FY06; $20K FY07**			
SCHEDULE STATUS **0**			

POOLED FUND STUDY (Continued . . .)

TPF-5(064): WESTERN ALLIANCE FOR QUALITY TRANSPORTATION (WAQTC)

PIC: **PL05.064**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE):	PROJECT MANAGER:		PRINCIPAL INVESTIGATOR: **ALASKA**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION: **TIM BIEL**	DIVISION: **MATERIALS**		
DELIVERABLE: **Cleared by FHWA; Need to obligate $10K FY06; $10K FY07**			
SCHEDULE STATUS **0**			

TPF-5(068): LONG TERM MAINTENANCE OF LOAD AND RESISTANCE FACTOR DESIGN SPECIFICATIONS

PIC: **PL05.068**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE):	PROJECT MANAGER:		PRINCIPAL INVESTIGATOR:
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION: **BOYD WHEELER**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Cleared by FHWA**			
SCHEDULE STATUS **0**			

TPF-5(097): EVALUATION OF SAFETY EDGE

PIC: **PL05.097**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE):	PROJECT MANAGER:		PRINCIPAL INVESTIGATOR: **FHWA**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **STRUCTURES**		
DELIVERABLE: **Cleared by FHWA; $45K Committed; Need to obligate $15K FY06; $15K FY07**			
SCHEDULE STATUS **0**			

TPF-5(099): EVALUATION OF LOW COST SAFETY IMPROVEMENTS

PIC: **PL05.099**	PROJECT NO:	JOB NO:	CONTRACT NO:
STATUS (PERCENT COMPLETE):	PROJECT MANAGER:		PRINCIPAL INVESTIGATOR: **FHWA**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION: **ROBERT HULL**	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **Cleared by FHWA; $150K Committed FY06**			
SCHEDULE STATUS **0**			

SPR

ASSESS USER IMPACTS OF FAST TRACK CONTRUCTION PH 2

PIC: **AM00.001**	PROJECT NO: **H005208H**	JOB NO: **81FR0364**	CONTRACT NO: **04-9019**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **PETER MARTIN**
START DATE: **7/1/2003**	END DATE: **12/31/2004**	ESTIMATED COST: **$35,000**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **BOB WESTOVER**	DIVISION: **CONSTRUCTION**		
DELIVERABLE: **User impacts on 6 to 8 STIP projects. Report UT-04.21**			
SCHEDULE STATUS **Completed.**			

CONDITION EXIST HWY CULVERTS-IMPLEMENTATION

PIC: **AM02.001**	PROJECT NO: **H005408H**	JOB NO: **81FR0232**	CONTRACT NO: **03-9097**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **TIM MCGRATH**
START DATE: **9/25/2002**	END DATE: **7/30/2004**	ESTIMATED COST: **$156,700**	UNIVERSITY/CONSULTANT: **SIMPSON GUMPERTZ AND HEGE**
CHAMPION: **MICHAEL FAZIO**	DIVISION: **HYDRAULICS**		
DELIVERABLE: **Deliverables:Report, recommendations for monitoring program, and recommendations for spec. changes**			
SCHEDULE STATUS **Completed. Close contract**			

WEB-DELIVERED PAVEMENT & TRAFFIC DATA

PIC: **AM03.002**	PROJECT NO: **H005408H**	JOB NO: **81FR0346**	CONTRACT NO: **03-9102**
STATUS (PERCENT COMPLETE): **95%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **GARYN PERRETT**
START DATE: **12/1/2002**	END DATE: **12/31/2005**	ESTIMATED COST: **$43,000**	UNIVERSITY/CONSULTANT: **iWorQ**
CHAMPION: **REGIONS; RMEs**	DIVISION: **MATERIALS TRAFFIC & SAFETY**		
DELIVERABLE: **Web delivered data almanac, training**			
SCHEDULE STATUS **Training scheduled for Fall 06**			

VEHICLE FEATURE EXTRACTION

PIC: **AM03.004**	PROJECT NO: **H005208H**	JOB NO: **81FR0347**	CONTRACT NO: **04-9007**
STATUS (PERCENT COMPLETE): **80%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **CHENG**
START DATE: **6/1/2003**	END DATE: **12/31/2007**	ESTIMATED COST: **$46,400**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY COMP**
CHAMPION: **BILL LAWRENCE**	DIVISION: **PROGRAM DEVELOPMENT TRAFFI**		
DELIVERABLE: **Deliverable: Report, software loaded in TOC to count and classify traffic**			
SCHEDULE STATUS **Behind schedule by 6 months**			

PREVENTIVE DECK JOINT & SURFACE TREATMENT STRATEGY

PIC: **AM04.001**	PROJECT NO: **H005408H**	JOB NO: **81FR0336**	CONTRACT NO: **04-9081**
STATUS (PERCENT COMPLETE): **95%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **SPENCER GUTHRIE**
START DATE: **10/10/2003**	END DATE: **6/30/2006**	ESTIMATED COST: **$143,915**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **DAVE EIXENBERGER**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Final Report pending, will publish**			
SCHEDULE STATUS **On schedule**			

EVALUATION STUDY OF ADVANCED SIGNAL WARNING DEVICES

PIC: **AM05.001**	PROJECT NO: **H005408H**	JOB NO: **81FR0515**	CONTRACT NO: **05-9046**
STATUS (PERCENT COMPLETE): **50%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **GRANT SCHULTZ**
START DATE: **7/1/2004**	END DATE: **12/31/2007**	ESTIMATED COST: **$47,000**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **MACK CHRISTENSEN**	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **0**			
SCHEDULE STATUS **Extended for extra scope**			

MONITOR MSE WALLS PH 2

PIC: **TB00.308**	PROJECT NO: **H005408H**	JOB NO: **81FR0592**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **JIM BAY**
START DATE: **1/0/1900**	END DATE: **1/0/1900**	ESTIMATED COST: **$0**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **JON BISCHOFF**	DIVISION: **GEOTECHNICAL**		
DELIVERABLE: **0**			
SCHEDULE STATUS **Close project**			

HEALTH MONITORING OF I-15 STRUCTURES

PIC: **TB01.405**	PROJECT NO: **H005408H**	JOB NO: **81FR0405**	CONTRACT NO: **05-9261**
STATUS (PERCENT COMPLETE): **10%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **MARVIN HALLING**
START DATE: **5/1/2005**	END DATE: **12/31/2007**	ESTIMATED COST: **$144,440**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **TB CONSORTIUM**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Deliverable: Enhanced Monitoring System at bridge C-846**			
SCHEDULE STATUS **Behind schedule by 12 months**			

BRIDGE SCOUR COUNTER MEASURES; PHASE I

PIC: **UT00.305**	PROJECT NO: **H005408H**	JOB NO: **81FR0142**	CONTRACT NO: **04-9001**
STATUS (PERCENT COMPLETE): **99%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **ZUNDEL**
START DATE: 5/1912003	END DATE: **5/31/2007**	ESTIMATED COST: **$34,160**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **MICHAEL FAZIO**	DIVISION: **HYDRAULICS**		
DELIVERABLE: **Report delivered to Hydraulics div; next phase (UT05.402) will generate Manual.**			
SCHEDULE STATUS **0**			

DEVELOP UTAH WETLAND ASSESSMENT METHOD

PIC: **UT01.301**	PROJECT NO: **H005408H**	JOB NO: **81FR0214**	CONTRACT NO: **04-9044**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **CRAIG JOHNSON**
START DATE: **1/4/2003**	END DATE: **7/1/2006**	ESTIMATED COST: **$50,930**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **TERRY JOHNSON**	DIVISION: **ENVIRONMENTAL**		
DELIVERABLE: **Deliverable: Approved Assessment Method & Training.**			
SCHEDULE STATUS **Complete. Implementation underway**			

EVALUATE EFFECTIVENESS OF OIL/WATER SEPARATORS

PIC: **UT01.306**	PROJECT NO: **H005208H**	JOB NO: **81FR0215**	CONTRACT NO: **04-9130**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **ABDUL WAKIL**		PRINCIPAL INVESTIGATOR: **NICHOLS**
START DATE: **4/13/2004**	END DATE: **4/13/2005**	ESTIMATED COST: **$49,526**	UNIVERSITY/CONSULTANT: **STANTECH**
CHAMPION: **DENIS STUHFF, JERRY CHENEY**	DIVISION: **HYDRAULICS**		
DELIVERABLE: **Report UT-04.15, Software model, Standard Spec**			
SCHEDULE STATUS **Complete. Close contract**			

INVENTORY CRACKING OF NEW I-15 BRIDGES

PIC: **UT01.503**	PROJECT NO: **H005208H**	JOB NO: **81FR0212**	CONTRACT NO:
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DAN AVILA**		PRINCIPAL INVESTIGATOR: **CHRIS PANTELIDES**
START DATE:	END DATE: **1/0/1900**	ESTIMATED COST: **$0**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **BOYD WHEELER**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Report UT-04.04**			
SCHEDULE STATUS **Complete. Close contract**			

BRIDGE DECK STRATEGY

PIC: **UT01.504**	PROJECT NO: **H005208H**	JOB NO: **81FR0210**	CONTRACT NO: **03-9192**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **SPENCER GUTHRIE**
START DATE: **4/4/2003**	END DATE: **5/31/2005**	ESTIMATED COST: **$45,362**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **TODD JENSEN**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Manual has been delivered to Bridge Engineer for UDOT use.**			
SCHEDULE STATUS **Done. Closed**			

SIMULATOR FOR WINTER MAINTENANCE

PIC: **UT02.101**	PROJECT NO: **H005208H**	JOB NO: **81FR0344**	CONTRACT NO: **03-9134**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **STRAYER**
START DATE: **1/1/2003**	END DATE: **12/31/2004**	ESTIMATED COST: **$100,000**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **DAVE KINNECOM**	DIVISION: **MAINTENANCE**		
DELIVERABLE: **Deliverable: Simulator, Report UT-04.17**			
SCHEDULE STATUS **Completed. Close project**			

IMPLEMENTATION OF AASHTO DESIGN GUIDE

PIC: **UT02.204**	PROJECT NO: **H005408H**	JOB NO: **81FR0343**	CONTRACT NO: **03-9186**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **DARTER**
START DATE: **4/1/2003**	END DATE: **12/31/2005**	ESTIMATED COST: **$148,379**	UNIVERSITY/CONSULTANT: **ERES**
CHAMPION: **TIM BIEL**	DIVISION: **MATERIALS**		
DELIVERABLE: **Reports: UT-05.14I, UT-05.14II, UT-05.III, Training in our labs**			
SCHEDULE STATUS **Completed.**			

EVAL TRAFFIC & SAFETY INITIATIVES

PIC: **UT02.401**	PROJECT NO: **H005208H**	JOB NO: **81FR0341**	CONTRACT NO: **03-9153**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **SAITO**
START DATE: **2/15/2003**	END DATE: **2/15/2005**	ESTIMATED COST: **$83,000**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **ROBERT HULL**	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **Reports UT-04.10, UT-04.11, UT-05.12 & UT-05.13 have been published**			
SCHEDULE STATUS **Completed. Close project**			

UTAH LTPP MONITORING

PIC: **UT03.201**	PROJECT NO: **H005408H**	JOB NO: **81FR0512**	CONTRACT NO: **06-9028**
STATUS (PERCENT COMPLETE): **15%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **PEDRO ROMERO**
START DATE: **7/1/2005**	END DATE: **12/31/2006**	ESTIMATED COST: **$49,194**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **TIM BIEL**	DIVISION: **MATERIALS**		
DELIVERABLE: **Report on how Superpave performs**			
SCHEDULE STATUS **Behind by 3 months**			

MATERIALS CHARACTERIZATION OF THE M-E PAVEMENT DESIGN GUIDE, PHASE 2

PIC: **UT03.203**	PROJECT NO: **H005408H**	JOB NO: **81FR0511**	CONTRACT NO: **06-9083**
STATUS (PERCENT COMPLETE): **5%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **DARTER**
START DATE: **10/1/2005**	END DATE: **6/30/2008**	ESTIMATED COST: **$150,000**	UNIVERSITY/CONSULTANT: **ERES**
CHAMPION: **TIM BIEL**	DIVISION: **MATERIALS**		
DELIVERABLE: **Goal is to implement design process, Deliverable will be software, data (mat'l library, traffic library) and default values**			
SCHEDULE STATUS **0**			

IMPACTS OF RAISED MEDIANS

PIC: **UT03.301**	PROJECT NO: **H005408H**	JOB NO: **81FR0513**	CONTRACT NO: **05-8439**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR:
START DATE: **7/1/2005**	END DATE: **6/30/2006**	ESTIMATED COST: **$47,663**	UNIVERSITY/CONSULTANT: **PENNA POWERS**
CHAMPION: **NILE EASTON**	DIVISION: **TRAFFIC & SAFETY, COMMUNICAT**		
DELIVERABLE: **Draft DVD completed and brochure finalized**			
SCHEDULE STATUS **Completed. Close project**			

DEVELOPMENT OF ROAD USER-COST EVALUATION TOOL

PIC: **UT03.402**	PROJECT NO: **H005408H**	JOB NO: **81FR0510**	CONTRACT NO: **04-9090**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **MITSU SAITO**
START DATE: **11/1/2003**	END DATE: **10/31/2005**	ESTIMATED COST: **$35,000**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **MICHAEL KAZOROWSKI**	DIVISION: **CONSTRUCTION**		
DELIVERABLE: **Method to estimate user cost in rural areas, Report UT-05.11**			
SCHEDULE STATUS **Completed.**			

MONITORING SPLICED GIRDERS, DECK PANEL JOINTS & FRP RETRO-FIT

PIC: **UT03.503**	PROJECT NO: **H005408H**	JOB NO: **81FR0514**	CONTRACT NO: **04-9129**
STATUS (PERCENT COMPLETE): **50%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **CHRIS PANTELIDES**
START DATE: **3/1/2004**	END DATE: **12/31/2006**	ESTIMATED COST: **$25,000**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **BOYD WHEELER**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Data Collection Underway**			
SCHEDULE STATUS **on schedule**			

SMA PAVING MECHANISTIC PROPERTIES

PIC: **UT05.303**	PROJECT NO: **H005408H**	JOB NO: **81FR0641**	CONTRACT NO: **Jan-00**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **DOUG ANDERSON**	PRINCIPAL INVESTIGATOR: **DARTER**	
START DATE: **1/0/1900**	END DATE: **1/0/1900**	ESTIMATED COST: **$0**	UNIVERSITY/CONSULTANT: **ERES**
CHAMPION: **TIM BIEL**	DIVISION: **MATERIALS**		
DELIVERABLE: **0**			
SCHEDULE STATUS **Cancelled**			

FULL-DEPTH RECYCLING & STABILIZATION OF PAVEMENT BASE LAYERS

PIC: **UT05.304**	PROJECT NO: **H005408H**	JOB NO: **81FR0620**	CONTRACT NO:
STATUS (PERCENT COMPLETE): **60%**	PROJECT MANAGER: **DOUG ANDERSON**	PRINCIPAL INVESTIGATOR: **SPENCER GUTHERIE**	
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **TIM BIEL**	DIVISION: **ENVIRONMENTAL**		
DELIVERABLE: **Develop UDOT process to recycle base material, Report**			
SCHEDULE STATUS **0**			

DESIGN & DEVELOPMENT OF A CONTEXT SENSITIVE VISUAL RESOURCE ASSESSMENT & MANAGEMENT (

PIC: **UT05.401**	PROJECT NO: **H005408H**	JOB NO: **81FR0634**	CONTRACT NO: **07-9019**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **SHANA LINDSEY**	PRINCIPAL INVESTIGATOR: **JOHN ELLSWORTH**	
START DATE: **7/1/2006**	END DATE: **6/30/2008**	ESTIMATED COST: **$88,000**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **TERRY JOHNSON**	DIVISION: **ENVIRONMENTAL**		
DELIVERABLE: **VRAM System in workbook based system, with maps of context sensitive design types, Report**			
SCHEDULE STATUS **0**			

BRIDGE SCOUR COUNTER MEASURES PH 2

PIC: **UT05.402**	PROJECT NO: **H005408H**	JOB NO: **81FR0629**	CONTRACT NO: **06-9018**
STATUS (PERCENT COMPLETE): **20%**	PROJECT MANAGER: **DANIEL HSIAO**	PRINCIPAL INVESTIGATOR: **ALLEN ZUNDEL**	
START DATE: **5/1/2005**	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **MICHAEL FAZIO**	DIVISION: **HYDRAULICS**		
DELIVERABLE: **Deliverable will be Manual**			
SCHEDULE STATUS **On Schedule**			

ACCESS MANAGEMENT PERFORMANCE INDEX

PIC: **UT05.503**	PROJECT NO: **H005408H**	JOB NO: **81FR0630**	CONTRACT NO: **06-9149**
STATUS (PERCENT COMPLETE): **50%**	PROJECT MANAGER: **DOUG**	PRINCIPAL INVESTIGATOR: **GRANT SCHULTZ**	
START DATE: **3/1/2006**	END DATE: **2/28/2008**	ESTIMATED COST: **$35,000**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **TIM BOSCHERT**	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **Report outlining method for selecting access points**			
SCHEDULE STATUS **On Schedule**			

ADVANCED WARNING SIGNAL SITE SELECTION EVALUATION MATRIX

PIC: **UT05.606**	PROJECT NO: **H005408H**	JOB NO: **81FR0623**	CONTRACT NO: **06-9127**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **GRANT SCHULTZ**
START DATE: **1/1/2006**	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **SHANA**	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **0**			
SCHEDULE STATUS **0**			

PROGRAMMING OF STRONG GROUND MOTION INSTRUMENTATION OF NEW BRIDGES

PIC: **UT05.702**	PROJECT NO: **H005408H**	JOB NO: **81FR0632**	CONTRACT NO: **pending**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR:
START DATE: **1/0/1900**	END DATE: **1/0/1900**	ESTIMATED COST: **$0**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **TODD JENSEN**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Deliverable: Design Guidelines.**			
SCHEDULE STATUS **Behind Schedule. Developing scope**			

GEOPHYSICAL METHODS TO PRIOITIZE MITIGATION OPTIONS FOR SR-9 IN THE COAL HILL LANDSLIDE A

PIC: **UT05.706**	PROJECT NO: **H005408H**	JOB NO: **81FR0642**	CONTRACT NO: **06-9065**
STATUS (PERCENT COMPLETE): **50%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR:
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION:	DIVISION: **GEOTECHNICAL**		
DELIVERABLE:			
SCHEDULE STATUS **0**			

INVESTIGATION OFIMPROVEMENT OF DECK CONCRETE MIX DESIGN & CURING PRACTICES

PIC: **UT05.801**	PROJECT NO: **H005408H**	JOB NO: **81FR0625**	CONTRACT NO: **06-9057**
STATUS (PERCENT COMPLETE): **15%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **PAUL BARR**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **TODD JENSEN**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Deliverable will be new spec for structural concrete, no report expected**			
SCHEDULE STATUS **On Schedule**			

WORK ZONE TRAFFIC CONTROL MEASURES & CRASH OCCURRENCE

PIC: **??**	PROJECT NO: **H005408H**	JOB NO: **81FR0647**	CONTRACT NO: **05-9251**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **MITSU SAITO**
START DATE: **5/1/2005**	END DATE: **4/30/2007**	ESTIMATED COST: **$35,606**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **0**	DIVISION: **0**		
DELIVERABLE: **0**			
SCHEDULE STATUS **0**			

SPR *(Continued . . .)*

ON-LINE TRAFFIC ASSESSMENT OF CREATIVE HIGHWAY ADMINISTRATION TECHNIQUES

PIC: **MPC06.001**	PROJECT NO: **H005408H**	JOB NO: **81FR0643**	CONTRACT NO: **06-9027**
STATUS (PERCENT COMPLETE): **40%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **PETER MARTIN**
START DATE: **6/1/2005**	END DATE: **12/31/2006**	ESTIMATED COST: **$75,000**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **?**	DIVISION: **ENGINEERING SERVICES**		
DELIVERABLE: **Computer model for calibration of User Impact project, Report**			
SCHEDULE STATUS **On Schedule**			

DOWN-DRAG OF PILES

PIC: **UT98.504**	PROJECT NO: **H005408H**	JOB NO: **81FR9968**	CONTRACT NO: **=Master!G77**
STATUS (PERCENT COMPLETE): **50%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **KYLE ROLLINS**
START DATE: **8/1/2004**	END DATE: **4/15/2007**	ESTIMATED COST: **$46,581**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **JON BISCHOFF**	DIVISION: **GEOTECHNICAL**		
DELIVERABLE: **Field testing underway. Deliverable: Design Guidelines.**			
SCHEDULE STATUS **On Schedule**			

INNOVATIVE CONTRACTING METHODS

PIC: **UT99.105**	PROJECT NO: **H005408H**	JOB NO: **81FR0031**	CONTRACT NO: **01-9112**
STATUS (PERCENT COMPLETE): **85%**	PROJECT MANAGER: **KEN BERG**		PRINCIPAL INVESTIGATOR: **DOYT BOLLING**
START DATE: **12/1/2002**	END DATE: **5/31/2004**	ESTIMATED COST: **$60,000**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY LTAP**
CHAMPION: **BOB WESTOVER**	DIVISION: **PROJECT DEVELOPMENT**		
DELIVERABLE: **Deliverable will be Access software recommending contracting practices based on weighted factors; will include input from the Regions**			
SCHEDULE STATUS **Behind Schedule.**			

STATE

I-15 TESTBED PROG DEV

PIC: **TB01.410**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0330**	CONTRACT NO: **N/A**
STATUS (PERCENT COMPLETE): **N/A**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **0**
START DATE: **1/0/1900**	END DATE: **1/0/1900**	ESTIMATED COST: **$15,000**	UNIVERSITY/CONSULTANT: **0**
CHAMPION: **0**	DIVISION: **GEOTECHNICAL**		
DELIVERABLE: **Deliverable: Program Management.**			
SCHEDULE STATUS **Budget Spent. Close project.**			

SAFETY BENEFTS OF UDOT HWY PROGRAMS (WEB BASED)

PIC:	PROJECT NO: **RDS0508H**	JOB NO: **81SR0362**	CONTRACT NO: **03-9178**
STATUS (PERCENT COMPLETE):	PROJECT MANAGER: **DOUG ANDERSON**	PRINCIPAL INVESTIGATOR:	
START DATE: **7/31/2003**	END DATE: **12/31/2004**	ESTIMATED COST: **$69,000**	UNIVERSITY/CONSULTANT:
CHAMPION:	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE:	**Data mining reports**		
SCHEDULE STATUS	**Behind Schedule**		

ASSESSING THE SAFETY IMPACTS OF ACCESS MANAGEMENT TECHNIQUES

PIC: **AM05.003**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0517**	CONTRACT NO: **05-9148**
STATUS (PERCENT COMPLETE): **90%**	PROJECT MANAGER: **DOUG ANDERSON**	PRINCIPAL INVESTIGATOR: **G SCHULTZ**	
START DATE: **3/1/2006**	END DATE: **12/31/2007**	ESTIMATED COST: **$20,000**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **TIM BOSCHERT**	DIVISION: **PLANNING**		
DELIVERABLE:	**Report describing the benefits of managing access, UT-06.03 & UT-06.03a**		
SCHEDULE STATUS	**Draft final report submitted**		

EVALUATION OF RAPID MAPPER TECHNOLOGY

PIC: **AM06.001**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0516**	CONTRACT NO: **IAT**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DANIEL HSIAO**	PRINCIPAL INVESTIGATOR:	**0**
START DATE: **4/4/2005**	END DATE: **6/30/2005**	ESTIMATED COST: **$42,000**	UNIVERSITY/CONSULTANT: **RAPPIDMAPPER**
CHAMPION: **SEAN FERNANDEZ, MIKE SEELE**	DIVISION: **ADMINISTRATIVE**		
DELIVERABLE:	**Deliverable was UDOT contract with the vendor; no report.**		
SCHEDULE STATUS	**Complete.**		

DETERMINATION OF CRASH COSTS FOR USE IN BENEFIT/COST ANALYSIS (VALUE OF LIFE)

PIC: **AM06.003**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0636**	CONTRACT NO: **06-9029**
STATUS (PERCENT COMPLETE): **90%**	PROJECT MANAGER: **DOUG ANDERSON**	PRINCIPAL INVESTIGATOR: **JOE PERRIN**	
START DATE: **7/1/2005**	END DATE: **12/31/2006**	ESTIMATED COST: **$9,900**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **JIM MCMINIMEE**	DIVISION: **ADMINISTRATIVE**		
DELIVERABLE:	**Deliverables: Powerpoint presentation (received), Report (pending) to define value of life**		
SCHEDULE STATUS	**On Schedule.**		

TARGETED & ADAPTIVE SIMULATOR TRAINING FOR WINTER MAINTENANCE

PIC: **AM06.004**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0635**	CONTRACT NO: **06-9040**
STATUS (PERCENT COMPLETE): **30%**	PROJECT MANAGER: **SHANA LINDSEY**	PRINCIPAL INVESTIGATOR: **STRAYER**	
START DATE: **9/15/2005**	END DATE: **12/31/2007**	ESTIMATED COST: **$77,011**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **STAN BURNS**	DIVISION: **MAINTENANCE**		
DELIVERABLE:	**Deliverable: Training program**		
SCHEDULE STATUS	**0**		

OLDER DRIVER STUDY: EVALUATION OF SAFETY EFFECTS OF PAVEMENT MARKINGS AND SIGNAGE

PIC: **AM06.005**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0638**	CONTRACT NO: **PENDING**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **SAITO**
START DATE: **1/0/1900**	END DATE: **1/0/1900**	ESTIMATED COST: **$0**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **SHANA**	DIVISION: **ADMINISTRATIVE**		
DELIVERABLE: **0**			
SCHEDULE STATUS **0**			

PAVEMENT MARKING STUDY (TEST SECTIONS)

PIC: **AM06.006**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0639**	CONTRACT NO: **QIT**
STATUS (PERCENT COMPLETE): **40%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **IN-HOUSE**
START DATE:	END DATE:	ESTIMATED COST: **$0**	UNIVERSITY/CONSULTANT: **0**
CHAMPION: **VINCENT**	DIVISION: **ADMINISTRATIVE**		
DELIVERABLE: **Deliverable will be Guidelines for Regions**			
SCHEDULE STATUS **0**			

ADAPTIVE SIGNAL CONTROL IMPLEMENTATION & EVALUATION

PIC: **MPC05.001**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0510**	CONTRACT NO: **05-9116**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **PETER MARTIN**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **DAVE KINNECOM**	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **Report UT-05.16**			
SCHEDULE STATUS **Completed. Close project**			

EFFECTIVENESS OF HOV LANES PH 3

PIC: **MPC05.002**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0510**	CONTRACT NO: **05-9116**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **PETER MARTIN**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **DAVE KINNECOM**	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **Report UT-x**			
SCHEDULE STATUS **Completed. Close project**			

ADVANCE TRAVELER INFORMATION SYSTEMS (ATIS)

PIC: **MPC05.003**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0510**	CONTRACT NO: **05-9116**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **PETER MARTIN**
START DATE: **11/1/2004**	END DATE: **12/31/2005**	ESTIMATED COST: **$29,000**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **ROBERT HULL**	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **Report UT-x**			
SCHEDULE STATUS **Completed. Close project**			

UTAH INTERSECTION SAFETY

PIC: **MPC05.004**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0510**	CONTRACT NO: **05-9116**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **WAYNE COTTRELL**
START DATE: **11/1/2004**	END DATE: **12/31/2005**	ESTIMATED COST: **$45,000**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: ROBERT HULL	DIVISION: TRAFFIC & SAFETY		
DELIVERABLE: **Report UT-x**			
SCHEDULE STATUS: **Completed. Close project**			

DYNAMIC CHARACTERISTICS OF NEW BRIDGES

PIC: **TB00.302**	PROJECT NO: **RDS0608H**	JOB NO: **81S15302**	CONTRACT NO: **04-9150**
STATUS (PERCENT COMPLETE): **85%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **MARVIN HALLING**
START DATE: **1/1/2004**	END DATE: **9/30/2006**	ESTIMATED COST: **$170,500**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **TB CONSORTIUM**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Testing/Analysis complete; Draft Report submitted, awaiting final. Deliverable: Report.**			
SCHEDULE STATUS: **Behind Schedule**			

STRONG MOTION INSTRUMENTATION OF BRIDGE SITE

PIC: **TB00.305**	PROJECT NO: **RDS0608H**	JOB NO: **81S15305**	CONTRACT NO: **01-9215**
STATUS (PERCENT COMPLETE): **80%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **RONALD PORCELLA**
START DATE: **5/15/2001**	END DATE: **5/30/2006**	ESTIMATED COST: **UNIT COST**	UNIVERSITY/CONSULTANT: **UNITED STATES GEOLOGIC SUR**
CHAMPION: **TODD JENSEN**	DIVISION: **STRUCTURES**		
DELIVERABLE: **Deliverable: Equipment Maintenance.**			
SCHEDULE STATUS: **On Schedule.**			

CORROSION EVALUATION OF STEEL PIPE PILES

PIC: **TB00.309**	PROJECT NO: **RDS0608H**	JOB NO: **81S15309**	CONTRACT NO: **03-9073**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **KYLE ROLLINS**
START DATE: **9/1/2000**	END DATE: **2/1/2005**	ESTIMATED COST: **$43,600**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **JON BISCHOFF**	DIVISION: **GEOTECHNICAL**		
DELIVERABLE: **Deliverable: Report with Design Guidelines.**			
SCHEDULE STATUS: **Completed. Close project**			

LATERAL LOADS ON PILE GROUPS PH 4

PIC: **TB00.310**	PROJECT NO: **RDS0608H**	JOB NO: **81S15310**	CONTRACT NO: **03-9012**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **KYLE ROLLINS**
START DATE: **1/1/2002**	END DATE: **2/1/2005**	ESTIMATED COST: **$88,700**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **JON BISCHOFF**	DIVISION: **GEOTECHNICAL**		
DELIVERABLE: **Deliverable: Report & Design Guidelines.**			
SCHEDULE STATUS: **Completed. Close project**			

EVAL. SHELBY VS PISTON SAMPLERS & MONITOR MSE WALLS

PIC: **UT00.503**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0123**	CONTRACT NO: **01-9118**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **JIM BAY / LOREN ANDERSON**
START DATE: **7/1/2000**	END DATE: **5/31/2004**	ESTIMATED COST: **$100,000**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **N/A**	DIVISION: **GEOTECHNICAL**		
DELIVERABLE: **Deliverable: Report, Analysis Recommendations.**			
SCHEDULE STATUS **Completed. Close project**			

ADAPTIVE SIGNAL CONTROL PH 3

PIC: **UT01.401**	PROJECT NO: **RDS0508H**	JOB NO: **81SR0442**	CONTRACT NO: **04-9018**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **PETER MARTIN**
START DATE: **7/1/2003**	END DATE: **12/31/2004**	ESTIMATED COST: **$100,000**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **0**	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **Study effectiveness of signal, will yield Report**			
SCHEDULE STATUS **0**			

CRASH DATA DEL USING GIS PH 2

PIC: **UT01.402**	PROJECT NO: **RDS0508H**	JOB NO: **81SR0341**	CONTRACT NO: **03-9041**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **GARYN PERRETT**
START DATE: **9/1/2002**	END DATE: **12/31/2004**	ESTIMATED COST: **$7,950**	UNIVERSITY/CONSULTANT: **iWorQ**
CHAMPION:	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **Web site**			
SCHEDULE STATUS **Completed. Close project**			

EFFECTIVE OF HOV LANES PH 2

PIC: **UT01.405**	PROJECT NO: **RDS0508H**	JOB NO: **81SR0443**	CONTRACT NO: **04-9018**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **STAN BURNS**		PRINCIPAL INVESTIGATOR: **PETER MARTIN**
START DATE: **1/0/1900**	END DATE: **1/0/1900**	ESTIMATED COST: **$0**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION:	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **Final Report published (UT-04.13)**			
SCHEDULE STATUS **Complete, close project**			

HYDRAULIC DISCHARGE CALCS, PH 2 (FREQUENCY)

PIC: **UT02.301A**	PROJECT NO: **RDS0508H**	JOB NO: **81SR0350**	CONTRACT NO: **04-9123**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **WILLIAM GRENNEY**
START DATE: **2/1/2004**	END DATE: **2/28/2005**	ESTIMATED COST: **$20,498**	UNIVERSITY/CONSULTANT: **UTAH STATE UNIVERSITY**
CHAMPION: **MICHAEL FAZIO**	DIVISION: **HYDRAULICS**		
DELIVERABLE: **Final report published (UT-05.02).**			
SCHEDULE STATUS **Complete, project closed**			

HYDRAULIC DISCHARGE CALCS, PH 2 (CANYONS)

PIC: **UT02.301B**	PROJECT NO: **RDS0508H**	JOB NO: **81SR0441**	CONTRACT NO: **04-9029**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DANIEL HSIAO**		PRINCIPAL INVESTIGATOR: **SONJA PERRICA**
START DATE: **8/1/2003**	END DATE: **9/1/2004**	ESTIMATED COST: **$42,500**	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION: **MICHAEL FAZIO**	DIVISION: **HYDRAULICS**		
DELIVERABLE: **Final report published (UT-04.12); Developed New Equations, Hydraulics is using them**			
SCHEDULE STATUS **Complete, project closed**			

SMART PDA-SOFTWARE DEVELOPMENT

PIC: **UT02.403A**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0359**	CONTRACT NO: **04-9039**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **CHENG**
START DATE: **5/1/2003**	END DATE: **12/1/2006**	ESTIMATED COST: **$85,650**	UNIVERSITY/CONSULTANT: **USU COMPUTER SCIENCE**
CHAMPION: **BILL LAWRENCE**	DIVISION: **MATERIALS**		
DELIVERABLE: **PDA Software development, implementation**			
SCHEDULE STATUS **Behind Schedule by 6 months**			

SMART PDA-VAN INSTRUMENTATION

PIC: **UT02.403B**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0360**	CONTRACT NO: **03-9189**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **SAMSUNG, DENNIS**
START DATE: **4/1/2003**	END DATE: **12/31/2004**	ESTIMATED COST: **$39,335**	UNIVERSITY/CONSULTANT: **SAMSUNG SDS AMERICA**
CHAMPION: **BILL LAWRENCE**	DIVISION: **MATERIALS**		
DELIVERABLE: **Deliverable was PDA Van**			
SCHEDULE STATUS **Contract cancelled.**			

VIDEO DETECTION FIELD TEST

PIC: **UT03.403**	PROJECT NO: **RDS0508H**	JOB NO: **81SR0444**	CONTRACT NO: **04-9018**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **PETER MARTIN**
START DATE: **7/31/2003**	END DATE: **12/31/2004**	ESTIMATED COST: **$45,000**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **DAVE KINNECOM**	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **Signal installation, Report UT-04.14**			
SCHEDULE STATUS **Complete. Close project**			

MITIGATE QUEUE LENGTHS IN WORK ZONE TRAFFIC CONTROL

PIC: **UT05.101**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0618**	CONTRACT NO: **04-9156**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **BLAINE LEONARD**		PRINCIPAL INVESTIGATOR: **MITSU SAITO**
START DATE: **N/A**	END DATE: **N/A**	ESTIMATED COST: **$18,000**	UNIVERSITY/CONSULTANT: **BRIGHAM YOUNG UNIVERSITY**
CHAMPION: **DARRELL GIANNONATTI**	DIVISION: **DARRELL GIANNONATTI**		
DELIVERABLE: **Deliverable: Training, Recommendations for Field Practices.**			
SCHEDULE STATUS **On Schedule.**			

WORKER VISIBILITY

PIC: **UT05.103**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0626**	CONTRACT NO: **06-9026**
STATUS (PERCENT COMPLETE): **95%**	PROJECT MANAGER: **MICHELLE PAGE**		PRINCIPAL INVESTIGATOR: **WAYNE COTTRELL**
START DATE: **6/1/2005**	END DATE: **1/1/2006**	ESTIMATED COST: **$19,135**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **0**	DIVISION: **CONSTRUCTION**		
DELIVERABLE: **0**			
SCHEDULE STATUS **Completed. Close project**			

SKID INDEX TRIGGER VALUES

PIC: **UT05.206**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0627**	CONTRACT NO: **QIT**
STATUS (PERCENT COMPLETE): **20%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **DOUG ANDERSON**
START DATE:	END DATE:	ESTIMATED COST: **$3,000**	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION: **BILL LAWRENCE**	DIVISION: **PROGRAM DEVELOPMENT**		
DELIVERABLE: **Developing Policy & Procedure to deal with slippery pavements**			
SCHEDULE STATUS **On Schedule.**			

DEVELOPMENT OF REGIONAL FLOW CHARACTERISTIC REGRESSION MODELS OF UTAH STREAMS

PIC: **UT05.4X1**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0644**	CONTRACT NO: **06-8479**
STATUS (PERCENT COMPLETE): **20%**	PROJECT MANAGER: **MICHAEL FAZIO**		PRINCIPAL INVESTIGATOR: **PATRICK LAMBERT**
START DATE: **12/15/2005**	END DATE: **6/30/2006**	ESTIMATED COST: **$35,000**	UNIVERSITY/CONSULTANT: **USGS**
CHAMPION:	DIVISION: **HYDRAULICS**		
DELIVERABLE:			
SCHEDULE STATUS **On Sched**			

GOOD ROADS COST LESS

PIC: **UT05.510**	PROJECT NO: **RDS0608H**	JOB NO: **81SR0640**	CONTRACT NO: **06-9015**
STATUS (PERCENT COMPLETE): **90%**	PROJECT MANAGER: **ABDUL WAKIL**		PRINCIPAL INVESTIGATOR: **0**
START DATE: **7/18/2005**	END DATE: **8/31/2007**	ESTIMATED COST: **$20,000**	UNIVERSITY/CONSULTANT: **DEIGHTON ASSOCIATES, LTD**
CHAMPION: **KIM SCHVANELVEDT, GARY KU**	DIVISION: **MAINTENANCE**		
DELIVERABLE: **Prioritization model for pavement condition data, Report**			
SCHEDULE STATUS **0**			

ADAPTIVE SIGNAL CONTROL PH 5

PIC: **UT01.401B**	PROJECT NO: **RDS0508H**	JOB NO: **81SR0645**	CONTRACT NO: **=Master!G111**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **SHANA LINDSEY**		PRINCIPAL INVESTIGATOR: **PETER MARTIN**
START DATE: **7/1/2006**	END DATE: **10/30/2007**	ESTIMATED COST: **$45,000**	UNIVERSITY/CONSULTANT: **UNIVERSITY OF UTAH**
CHAMPION: **0**	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **0**			
SCHEDULE STATUS **0**			

STATE *(Continued . . .)*

URBAN INTERSECTION SAFETY: ISSUES, CONTRIBUTING FACTORS AND MITIGATIONS-FURTHER STUDY

PIC: **UT05.608**	PROJECT NO: **0**	JOB NO: **0**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **DOUG ANDERSON**		PRINCIPAL INVESTIGATOR: **0**
START DATE: **1/0/1900**	END DATE: **1/0/1900**	ESTIMATED COST: **$0**	UNIVERSITY/CONSULTANT: **0**
CHAMPION: **0**	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **0**			
SCHEDULE STATUS **Cancelled Project**			

I-215 PAVEMENT MARKING STUDY (TEST DECK)

PIC: **XF05.001**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0401**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **70%**	PROJECT MANAGER: **KEN BERG**		PRINCIPAL INVESTIGATOR: **0**
START DATE: **1/0/1900**	END DATE: **1/0/1900**	ESTIMATED COST: **$0**	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION: **0**	DIVISION: **MAINTENANCE**		
DELIVERABLE: **0**			
SCHEDULE STATUS **0**			

TECHRETE PATCHES (I-215)

PIC: **XF05.002**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0402**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **85%**	PROJECT MANAGER: **KEN BERG**		PRINCIPAL INVESTIGATOR: **0**
START DATE: **1/0/1900**	END DATE: **1/0/1900**	ESTIMATED COST: **$0**	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION: LARRY LIMBERIS	DIVISION: MAINTENANCE		
DELIVERABLE: **0**			
SCHEDULE STATUS **0**			

EXPERIMENTAL FEATURES

HOT MIX IN PLACE RECYCLE (GUNNISON & FISH LAKE)

PIC: **XF05.003**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0403**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **BARRY SHARP**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **MATERIALS**		
DELIVERABLE:			
SCHEDULE STATUS **Completed. Close project**			

I-215 & RR GROOVED 3M CONTRAST TAPE

PIC: **XF05.004**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0404**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **BARRY SHARP**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION: **0**	DIVISION: **CONSTRUCTION**		
DELIVERABLE: **0**			
SCHEDULE STATUS **Completed. Close project**			

EXPERIMENTAL FEATURES (Continued . . .)

8" Wide Traffic Marking

PIC: **XF05.005**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0405**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **BARRY SHARP**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **MAINTENANCE**		
DELIVERABLE: **Final Report**			
SCHEDULE STATUS **Completed. Close project**			

0.086" Delineator Post Study

PIC: **XF05.006**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0406**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **10%**	PROJECT MANAGER: **BARRY SHARP**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **MAINTENANCE**		
DELIVERABLE:			
SCHEDULE STATUS **0**			

MISCELLANEOUS EXPERIMENTAL FEATURES (OLD PROJECTS)

PIC: **XF05.007**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0300**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **KEN BERG**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **0**		
DELIVERABLE: **0**			
SCHEDULE STATUS **Completed. Close project**			

BEAT-BP CRASH CUSHION

PIC: **XF06.001**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0501**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **MICHELLE PAGE**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **TRAFFIC & SAFETY**		
DELIVERABLE: **0**			
SCHEDULE STATUS **Project Cancelled**			

POLYUREA TRUCK BED LINER

PIC: **XF06.002**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0502**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **MICHELLE PAGE**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION:		
DELIVERABLE:			
SCHEDULE STATUS **Project Cancelled**			

EXPERIMENTAL FEATURES (Continued . . .)

WATERBORNE GROOVED SKIPS/SHOULDERS (I-215)

PIC: **XF06.003**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0503**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **50%**	PROJECT MANAGER: **KEN BERG**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **MAINTENANCE**		
DELIVERABLE:			
SCHEDULE STATUS **0**			

RECESSED PLOWABLE PAVEMENT MARKINGS (SR201)

PIC: **XF06.005**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0505**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **KEN BERG**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **MAINTENANCE**		
DELIVERABLE:			
SCHEDULE STATUS **0**			

URBAN MILE MARKER ALTERNATIVES (R2)

PIC: **XF06.006**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0506**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **20%**	PROJECT MANAGER: **KEN BERG**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **MAINTENANCE**		
DELIVERABLE:			
SCHEDULE STATUS **0**			

BRIDGE CORROSION MONITORING SYSTEM (OGDEN)

PIC: **XF06.007**	PROJECT NO: **RDS0608H**	JOB NO: **81SX05S1?**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **10%**	PROJECT MANAGER: **KEN BERG**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **STRUCTURES**		
DELIVERABLE:			
SCHEDULE STATUS **0**			

CENTAUR SNOW-RAIL FENCE

PIC: **XF06.008**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0508**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **KEN BERG**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **MAINTENANCE**		
DELIVERABLE:			
SCHEDULE STATUS **0**			

EXPERIMENTAL FEATURES (Continued . . .)

INLAID THERMO PAVEMENT MESSAGES (14700 SOUTH)

PIC: **XF06.009**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0509**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **50%**	PROJECT MANAGER: **KEN BERG**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **MAINTENANCE**		
DELIVERABLE:			
SCHEDULE STATUS **0**			

3M WET REFLECTIVE 380 SERIES TAPE (I-80; STILLMANS TO LAMBS)

PIC: **XF06.010**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0510**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **20%**	PROJECT MANAGER: **BARRY SHARP**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **MAINTENANCE**		
DELIVERABLE:			
SCHEDULE STATUS **0**			

GEOGRID (10400 SOUTH; RR TO BANGERTER)

PIC: **XF06.011**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0511**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **5%**	PROJECT MANAGER: **MICHELLE PAGE**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **MATERIALS**		
DELIVERABLE:			
SCHEDULE STATUS **Project Cancelled**			

GEOGRID (STATE STREET; 9000 TO 10600 SOUTH)

PIC: **XF06.012**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0512**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **5%**	PROJECT MANAGER: **BARRY SHARP**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **MATERIALS**		
DELIVERABLE:			
SCHEDULE STATUS **0**			

3M 820 WET REFLECTIVE TAPE

PIC: **XF03.012**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0212**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **100%**	PROJECT MANAGER: **BARRY SHARP**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION:	**0**	
DELIVERABLE:			
SCHEDULE STATUS **Completed. Close project**			

EXPERIMENTAL FEATURES (Continued . . .)

3M PLYUREA LMP 1200 TRAFFIC

PIC: **XF03.013**	PROJECT NO: **RDS0608H**	JOB NO: **81SX0213**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **90%**	PROJECT MANAGER: **BARRY SHARP**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST:	UNIVERSITY/CONSULTANT: **UDOT**
CHAMPION:	DIVISION: **0**		
DELIVERABLE:			
SCHEDULE STATUS **0**			

0

PIC:	PROJECT NO: **0**	JOB NO: **0**	CONTRACT NO: **0**
STATUS (PERCENT COMPLETE): **0%**	PROJECT MANAGER: **0**		PRINCIPAL INVESTIGATOR: **0**
START DATE:	END DATE:	ESTIMATED COST: **$0**	UNIVERSITY/CONSULTANT: **0**
CHAMPION: **0**	DIVISION: **0**		
DELIVERABLE: **0**			
SCHEDULE STATUS **0**			

Appendix C

Research Projects Funded from the 2006 UTRAC Workshop

Funding Priority	Prob No.	Problem Title	Discipline	Approx Budget
1	06.01-2	Quality and Safety During Nighttime Construction Activities	Construction	$10,000
2	06.02-6	Pavement Distress in 9.5mm vs. 12.5 Asphalt on Thin Overlays	Maintenance	$35,000
3	06.03-6	Validate Hamburgh Wheel Tracker using Field Tested Superpave Mixes	Materials & Pavements	$60,000
4	06.04-4	Development of an Indirect Wildlife Impact Methodology	Environmental	$96,000
5	06.05-6	Seismic Vulnerability and Emergency Response of UDOT Lifelines	Planning & Asset Mngmnt	$90,000
6	06.06-3	A Safety Analysis of Fatigue and Drowsy Driving	Traffic Mngmnt & Safety	$39,500
7	06.07-6	Stone Column Treatment with Wick Drains in Silty Sands	Geotechnical	$30,000
8	06.08-1	Evaluation of Bridges for Seismic Retrofit	Structural	$120,000
9	06.09-1	Fish Passage at Utah Culverts: Strategy, Assessment, and Design (also ranked #2 by Environmental Group)	Hydraulics	$74,000
10	06.07-3	Assessment of Mud Balance Test for Quality Assurance in Ground Anchor Installation (also ranked #6 by Materials Group)	Geotechnical	$4,000
11	06.01-3	GIS Project Tracking Website	Construction	$95,000
12	06.06-2	Evaluation of the Safety and Design Integrity of Two-Lane Rural Highways Using the Interactive Highway Safety Design Model (IHSDM) Developed by FHWA	Traffic Mngmnt & Safety	$47,700
13	06.03-2	Asset Improvement Tracking – (construction history) (also ranked #3 by Planning Group)	Materials & Pavements	$30,000
14	06.02-1	Install Avalanche Monitoring System	Maintenance	$100,000

15	06.07-10	Development of MSE Wall Inspection Plan Based on Failure Mode Analysis and Risk Assessment	Geotechnical	$40,000
16	06.07-5	Improved Performance of MSE Walls	Geotechnical	$25,000
17	06.09-2	Estimating Peak Flow Statistics for Ungaged Streams in Utah-Development of Regional Flow Characteristic Regression Models and web-based, GIS Model User Interface	Hydraulics	$35,000
18	06.05-7	Calibration and Validation of I-15 VISSIM model	Planning & Asset Mngmnt	$30,000
19	06.08-2	Calibration of AASHTOs New Prestress Loss Design Equations	Structural	$80,000

2006 RESEARCH PROBLEM STATEMENT

Problem Title: Quality and Safety During Nighttime Construction Activities **No.: 06.01-2**

Submitted By: Rob Wight **E-mail: rwight@utah.gov**

1. Briefly describe the problem to be addressed:

Over the past years UDOT has looked to do more and more road construction during the night to inconvenience the traveling public as little as possible. While this trend will likely continue, what are the implications to quality, productivity, worker safety, and public safety?

Develop a set of guidelines for the Department – include a checklist of when it is or is not appropriate to use night work for specific activities.
Identify ways to incorporate checklist items into the design process (scoping, planning, preconstruction, etc.)
Look at more of the construction activities and determine the
actual constructability issues (tack coat visibility, saw cutting of concrete, limitations of operations affects, lighting, etc.)
Consider outlining guidelines for specific types of construction projects.

Strategic Goal: ☐ **Preservation** X **Operation** ☐ **Capacity** X **Safety** (Check all that apply)

2. List the research objective(s) to be accomplished:

1. Literature Search: State of the Art – What are other states doing?

2. Identify the impacts on quality, productivity, worker safety and public safety.

3. Identify effective performance measures.

3. List the major tasks required to accomplish the research objective(s): **Estimated person-hours**

1. Literature Search

Hold a TAC meeting following literature search where findings are summarized.

2. Prepare draft document for review.

Include recommendations for policy, specifications (list requirements for Contractor), summary of national findings related to quality, productivity, worker safety, public safety, construction costs, user costs, etc.

Outline of a checklist that ties activities to the design process.

Provide guidelines indicating how to approach nighttime construction activities.

3. Solicit input/comments from TAC.

4. Prepare final document.

4. Outline the proposed schedule (when do you need this done, and how we will get there):

Start date: July 1, 2006

Literature Search Completed by: August 30, 2006
Draft Document Outlined by: October 1, 2006
Revisions/Comments: November 1, 2006
Final Document: January 15, 2007
Library Sessions by February 30, 2007

5. Indicate type of research and / or development project this is:

Large: ☐ **Research Project** ☐ **Development Project**
Small: X **Research Evaluation** ☐ **Experimental Feature** ☐ **New Product Evaluation** ☐ **Tech Transfer Initiative** :
☐ **Other**_____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

UDOT In House Study

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7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

Technique, training, report, manual of practice

8. Describe how this project will be implemented at UDOT.

It will impact future decisions to allow or modify construction work during nighttime hours with respect to safety and quality issues.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

UDOT will benefit from the implementation of this project through better decision making relating to nighttime construction activities.

10. Describe the expected risks, obstacles, and strategies to overcome these.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results):

Rob Wight

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): In House

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A) REs,		
B) Preconstruction		
C) Local Govts	Consider outlining an agreement that would be formed on a project by project basis with the cities.	
D) Safety		
E) OSHA (coordinate with)		
F)		
G)		

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

RESEARCH PROBLEM STATEMENT

Problem Title: Pavement Distress in 9.5mm Asphalt vs 12.5mm Asphalt on thin overlays **No.:06.02-06**

Submitted By: Lloyd Neeley / Norton Thurgood **E-mail:lneeley@utah.gov** **nthurgood@utah.gov**

1. Briefly describe the problem to be addressed:

Our field experience suggests that our 3/8" asphalt with high grade AC10 oil is holding up better under heavy truck loading than ½" asphalt with 64-34 PG oil, when placed at 1.5 inches to 2 inches. Both asphalts have been placed on I-84 in Western Box Elder County at 1.5-2 inches and the 3/8" had less rutting and shoving after 1-3 years.

Strategic Goal: ☒ **Preservation** ☐ **Operation** ☐ **Capacity** ☐ **Safety** (Check all that apply)

2. List the research objective(s) to be accomplished:

1. Can these findings be duplicated?

2. Should we be using strictly 3/8" with high-grade AC10 for thin overlay, including betterments?

3.

3. List the major tasks required to accomplish the research objective(s):

		Estimated person-hours
1.	Mill selected section for constant starting condition via contract	$20,000
2.	Fund testing and analysis to evaluate existing condition	40
3.	Pave in consecutive sections using both asphalts in different areas (Region 1 budget)	0
4.	Monitor sections for distress (UDOT Research and Region 1 Pavement Engineer)	100
5.	Write Report	20

4. Outline the proposed schedule (when do you need this done, and how we will get there):

Mill and Pave sections in summer of 2006. Record distress 3 times in 2007 and 3 times in 2008.

5. Indicate type of research and / or development project this is:

Large: ☒ **Research Project** ☐ **Development Project**
Small: ☐ **Research Evaluation** ☐ **Experimental Feature** ☐ **New Product Evaluation** ☐ **Tech Transfer Initiative :** ☐ **Other**

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

UDOT Region 1 w/ support from UDOT Research

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7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)
Performance comparison report of the two oil – aggregate size combinations.

8. Describe how will this project be implemented at UDOT.

Barry Sharp and Wayne Felix will create work plan.

Wayne Felix and Norton Thurgood will coordinate initial evaluation and construction.

Wayne Felix and Barry Sharp will analyze distress data and create report.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

Initial comparison which can lead to better decisions and perhaps set the stage a more advanced analysis in the future, since this will compare combinations and not specific components.

10. Describe the expected risks, obstacles, and strategies to overcome these.

11. List the key UDOT Champion of this project (person who will help Research steer and lead this project, and will participate in implementation of the results): Norton Thurgood

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $35,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone	Attended UTRAC?
A) Wayne Felix	Region One Pavement Engineer	801-620-1608	Yes
B) Brent Stokes	Region One Station Supervisor	435-2794327	Yes
C) Kevin Griffin	Region One Operations	801-620-1600	Yes
D) Spencer Guthrie	Brigham Young University / Civil Engineering	801-422-3864	Yes
E)			
F)			
G)			

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

LeGrand Johnson Company

Jack B. Parson Companies

UDOT Central Materials

UDOT Central Maintenance

RESEARCH PROBLEM STATEMENT

Problem Title: Validate Hamburg Wheel Tracker using Field Tested Superpave Mixes **No.: 06.3-6**

Submitted By: Kevin VanFrank **E-mail:** kvanfrank@utah.gov

1. Briefly describe the problem to be addressed:

The question is, do Hamburg Wheel Tracking Device (HWTD) testing results represent field performance of a mix?
A number of Superpave mixes have been built over the last ten years. Their field performance and mix design has been cataloged in a previous UTRAC study. Valadation of HWTD procedures and test methods is available by reproducing these Superpave mixes in the laboratory and documenting their performance under HWTD testing.

Strategic Goal: X Preservation ☐ Operation ☐ Capacity ☐ Safety (Check all that apply)

2. List the research objective(s) to be accomplished:

1. Forensically reproduce superpave mix designs used in UDOT projects.
2. Subject the mixes to the current HWTD test methods.
3. Develop bracketing tests using temperature and loading variables.
4. Analyze correlations between HWTD test results and field performance.

3. List the major tasks required to accomplish the research objective(s): **Estimated person-hours**

1. From previous research, Identify candidate pavements and mix designs.
2. Categorize pavement performance into reliable, moderately reliable and unreliable pavements.
3. Identify loading conditions on candidate pavements.
4. Obtain current UDOT HWTD test protocols. Identify bracketing procedures using temperature and loading variables
5. Reproduce the mix designs and test them under the above procedures.
   - First stage – use single lab
   - Second stage – incorporate multiple labs
6. Evaluate the results.
7. Propose test protocol for major binder grades, recycled asphalt (RAP) content and loadings.

4. Outline the proposed schedule (when do you need this done, and how we will get there):

Would like to see this begin during (2006) construction season with results by March 2008.

5. Indicate type of research and / or development project this is:

Large: X Research Project ☐ Development Project
Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative ☐ Other_____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

Consultant-University-UDOT Combination

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

1. Interim reports to indicate current experience and best to date assumptions.
2. Final report to summarize data and provide proposed test procedures for binder grade, RAP content and loading.
    a. Focus on long-term projections
    b. Include more than pass-fail judgements on predictions
3. Develop precision criteria
4. Identify possible variations to current 10 mm acceptance criteria

8. Describe how will this project be implemented at UDOT.

The test methods and limits would be incorporated into HWTD test protocols and into mix verification requirements/specifications. Consider for use in dispute resolutions,

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

By assuring that the HWTD testing results reflect field performance, UDOT will obtain pavements that are applicable to their service conditions. Reliable test results will give the department confidence that it is spending the appropriate amount of money to get the results it is planning for.

10. Describe the expected risks, obstacles, and strategies to overcome these.

Minimal number of entities with a HWTD. U of U has one.

11. List the key UDOT Champion of this project (person who will help Research steer and lead this project, and will participate in implementation of the results): Kevin VanFrank UDOT Engineer for Asphalt Materials (801) 965-4426

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $60,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone	Attended UTRAC?
A) Tim Biel	UDOT Central Materials	965-4859	y
B) Kevin VanFrank	UDOT Central Materials	965-4423	
C) Mark White	UDOT Central Materials	965-4295	
D) Stephan Charmont	Sem Materials		
E) Doyt Bolling	Utah LTAP		
F) Jim Cox	UDOT Region Three Materials Engineer – U of U Student		
G) Pedro Romero	U of U		

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

Possible FHWA Pooled Fund Topic

2006 RESEARCH PROBLEM STATEMENT

Problem Title: **Development of an indirect wildlife impact methodology** **No.: 06.04-04**

Submitted By: Tom Twedt, BIO-WEST; and Greg Punske, FHWA

E-mail: ttwedt@bio-west.com
Gregory.punske@fhwa.dot.gov

1. Briefly describe the problem to be addressed:

The indirect impacts on wildlife (primarily noise) on constructing and operating highways in Utah and nationwide are not well understood, but are of concern to resource agencies ever more frequently. The agencies are obligated to evaluate these impacts, but have no available methodologies or "tools" to use, thus they tend to "guesstimate" (probably overestimating) the impacts. A reliable method that can be replicated and readily applied is needed to facilitate the environmental review process and make it more efficient and accurate.

Strategic Goal: **X Preservation** **X Operation** ☐ **Capacity** ☐ **Safety**
(Check all that apply)

2. List the research objective(s) to be accomplished:

1. Evaluate existing state and federal approaches to indirect wildlife impact assessment
2. Develop a practical and feasible assessment methodology for Utah agencies.
3. Make methodology available for use.

3. List the major tasks required to accomplish the research objective(s): **Estimated person-hours**

1. Coordinate agency involvement and support	80
2. Determine and evaluate current approaches	160
3. Assess preliminary Legacy Parkway indirect avian impacts	240
4. Formulate assessment methodology	320
5. Coordinate with agencies and refine as appropriate	120
6. Develop guidance manual and distribute	280

4. Outline the proposed schedule (when do you need this done, and how we will get there):

Total Time = 2 years
Complete Tasks 1 and 2 first summer (2006)
Complete Task 3 following fall and winter (2006-2007)
Complete Task 4 next spring (2007)
Refine with 2007 Legacy data during fall /winter (2007/2008)
Complete Task 5 winter (2008)
Complete Task 6 spring (2008)

5. Indicate type of research and / or development project this is:

Large: **X Research Project** ☐ **Development Project**
Small: ☐ **Research Evaluation** ☐ **Experimental Feature** ☐ **New Product Evaluation** ☐ **Tech Transfer Initiative** :
☐ **Other**_____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

Consultant or University with highway impact assessment experience. Resource agency collaboration and oversight is available and desirable.

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7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

A technical report and a procedural manual which will be usable by UDOT specialists, agencies and consultants.

8. Describe how will this project be implemented at UDOT.

Upon approval, incorporate methodology into UDOT Environmental Process. Encourage use by resource agencies and consultants on appropriate new projects.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

Implementation will provide an acceptable method of accessing (and thus mitigating) indirect impacts to wildlife farm transportation projects. The results will benefit UDOT, Resources agencies, and the resource itself.

10. Describe the expected risks, obstacles, and strategies to overcome these.

No risks anticipated other than the challenge of applicability to wide range of ecosystems without extending testing and evaluations.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results):

Shane Marshall – Environmental Program Manager – (801) 965-4384

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3):

$96,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A) Brent Jensen	UDOT Envir/Hydraulics/Geotech Mgr.	801-965-4327
B) Paul West	UDOT Wildlife Specialist	801-965-4672
C) Tom Twedt	BIO-WEST, Inc.	435-752-4202
D) Greg Punske	FHWA Environmental Lead	801-963-0078 ext. 237
E) Adam Kozlowski	DWR Region 1	801-476-2740
F) Nathan Darnell	USFWS Ecological Services	801-975-3330 ext. 137

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

Utah Division of Wildlife Resources
US Fish and Wildlife Service
Federal Highway Administration
US Army Corps of Engineers
Transportation Research Board

2006 RESEARCH PROBLEM STATEMENT

Problem Title: Seismic Vulnerability and Emergency Response of UDOT Lifelines No.: 06-05-6

Submitted By: Steven Bartlett, Peter Martin, Steve Burian E-mail: bartlett@civil.utah.edu

1. Briefly describe the problem to be addressed:

Earthquakes pose a significant risk to UDOT's transportation infrastructure. This infrastructure is needed after a seismic event to provide emergency response, recovery and reconstruction functions. It is important that the transportation network perform these vital functions in a timely manner to reduce loss of life, property and commerce following a major earthquake.

This study proposes to focus on two key aspects: 1) seismic vulnerability of the transportation system and 2) emergency response. Risk assessment, traffic modeling and loss estimation techniques will be applied to the transportation network to determine vulnerability of the system and lifelines that most be protected, maintained or upgraded to perform emergency response and recovery functions. The results of vulnerability study will also be used to develop emergency response strategies/activities to aid in pre and post-event planning.

The study will first start in Salt Lake County and then later encompass the Urban Wasatch Front.

Strategic Goal: ☐ Preservation ☒ Operation ☐ Capacity ☒ Safety (Check all that apply)

2. List the research objective(s) to be accomplished:

1. Assess the seismic vulnerability of UDOT infrastructure using a systems approach.
2. Identify and prioritize UDOT's lifeline corridors and facilities using a risk based approach
3. Help UDOT develop a plan/program to protect/maintain/improve critical lifeline corridors
4. Help UDOT develop emergency response strategies/activities to enhance emergency response and recovery.

3. List the major tasks required to accomplish the research objective(s): Estimated person-hours: 2000 to 3000

1. Apply the FHWA seismic risk assessment model to Salt Lake Valley to estimate potential earthquake damage resulting from earthquake strong motion, liquefaction, fault rupture, earthquake-induced landslides and mass movement.
2. Use UDOT traffic models to assess the disruption to the system from earthquake damage: including user and economic losses and delays results from the damage.
3. Determine the losses for a scenario earthquake (rupture of the Salt Lake City segment of the Wasatch fault) and other nearby events using risk assessment.
4. Identify key corridors and facilities that should be targeted from improvement, upgrade, or replacement.
5. Help UDOT develop emergency response activities that minimize the disruption and restore the system to a serviceable capacity and added these activities to the emergency response plan.

4. Outline the proposed schedule (when do you need this done, and how we will get there):

One year proposed schedule for completion of Salt Lake County

5. Indicate type of research and / or development project this is:

Large: ☒ Research Project ☐ Development Project

Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative : ☐ Other_____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

University of Utah Civil and Environmental Dept. and the U of U Traffic Lab

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

1. Technical summary report
2. ARC GIS hazard assess,emt and traffic models
3. Implementation/Emergency Response plan for planning, traffic operations and safety.

8. Describe how this project will be implemented at UDOT.

1. Results of the study can be used for future planning and maintenance activities and funding of these activities
2. Traffic model can be used for other types of assessment (spills, floods, landslides, etc.)
3. Modifications/adaptations to UDOT's emergency response plan and activities

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

1. Reduction in seismic vulnerability and risk
2. A well-planned assessment and emergency response plan that includes realistic earthquake scenarios, damage and response to that damage.
3. Identification of key lifeline corridors and strategies to maintain, improve or upgrade these corridors.
4. A risk assessment/cost-benefit model that can be used for maintenance and planning purposes

10. Describe the expected risks, obstacles, and strategies to overcome these.

None. The proposed methods have already been developed by FHWA and the national center for earthquake engineering research. Traffic models have already been developed for the study area. This project will combine these models to develop the study and emergency response activities.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results):

Richard Clarke, Division of Maintenance
Walter Steinvorth, Division of Planning
Shana Lindsey, Division of Research

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $20k to $30k

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A) Bob Carey	DPE-DES	538-3784
B) Barry Welliever	Utah Seismic Safety Commission	barrywelliver2@earthlink.net
C) Gary Christenson	Utah Geologic Survey	537-3304

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

MPC
(THE MPC WILL BRING MATCHING MONEY (DOLLAR PER DOLLAR) FOR THIS STUDY.)

2006 RESEARCH PROBLEM STATEMENT

Problem Title: A Safety Analysis of Fatigue and Drowsy Driving **No.: 06.06-3**

Submitted By: Peter Tang (UDOT) and Grant Schultz (BYU) **E-mail:** ptang@utah.gov, gschultz@byu.edu

1. Briefly describe the problem to be addressed:

On average, at least 10 percent of all fatal crashes in Utah have been identified as fatigue-related. Driver fatigue, however, is difficult for officers to assess; hence fatigue-related crashes are likely under-reported and may be contributing to significantly more crashes than statistics show.

UDOT has recognized the seriousness of fatigue and drowsy driving and has taken a number of measures to reduce fatigue related crashes. One of the primary measures was the creation and installation of fatigue warning signs at several locations on I-80 between Tooele and Wendover beginning in November 2004. The 2005 crash data shows a reduction in crash numbers related to drowsy driving, presumably as a result of these signs. In addition, a task force comprised of UHP, UDOT, Utah Highway Safety Office, and a private company was formed in 2005 to promote awareness through various media avenues.

The purpose of this research is to develop a strategy to mitigate fatigue-related crashes statewide. First, to identify locations where fatigue is a primary causal factor for crashes in roadway segments. Second, to evaluate the effectiveness of current mitigation measures including the interstate fatigue warning signs and the educational campaign related to fatigue and drowsy driving. Third, to identify other mitigation measures for fatigued driving. Fourth, to provide recommendations for mitigation at locations in step 1 using the identified measures.

Strategic Goal: ☐ Preservation ☒ Operation ☒ Capacity ☒ Safety (Check all that apply)

2. List the research objective(s) to be accomplished:

1. Utilization of the GIS enabled web delivered data almanac and the C.A.R.S. data system to identify high crash locations where fatigue and drowsy driving may be the significant causes.
2. Evaluate the effectiveness of the mitigation efforts to date by UDOT related to fatigue and drowsy driving.
3. Propose and evaluate possible engineering solutions to mitigate the concerns at the identified locations. Solution could include additional signage, rumble strips, rest stops, and so forth.
4. Make recommendations for mitigation measures at identified locations.

3. List the major tasks required to accomplish the research objective(s): 18 months Estimated person-hours 1,750

1. Perform an in depth analysis of crash data from the C.A.R.S. data system and the GIS crash data almanac to identify fatigue and drowsy driving high crash locations on all major state routes.
2. Solicit input from emergency service personnel, UHP, and other local law enforcement personnel to verify high crash locations identified and to pinpoint additional locations.
3. Evaluate the effectiveness of the fatigue warning signs on I-80 through an analysis of crash data before and after installation combined with a survey of motorists along this stretch between Tooele and Wendover.
4. Perform literature review on the mitigation techniques available to reduce fatigue and drowsy driving.
5. Evaluate the effectives of the median/education campaign efforts.
6. Perform on-site visits to evaluate conditions and identify engineering mitigation efforts at each site.
7. Provide final recommendations and conclusions on both the effectiveness of current installations and future strategies.

4. Outline the proposed schedule (when do you need this done, and how we will get there):

It is recommended that this project begin in Fall 2006 with the initial tasks of the literature review and evaluation of effectiveness. Once the effectiveness is determined, additional sites can be identified and on-site visits performed in the summer 2007. Results would then be tabulated in the Fall 2007 and recommendations made.

5. Indicate type of research and / or development project this is:

Large: ☒ Research Project ☒ Development Project
Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative :
☐ Other _____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

University and UDOT Staff joint participation with input from focus groups comprised of UHP and local participants.

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

The deliverables expected from this project includes a report documenting the high crash locations for fatigued driving, as well as recommendations of mitigations for those locations. Also included will be an evaluation of current mitigation measures and documentation of the literature review and survey results. The report will serve as the basis of UDOT's strategy to mitigate fatigue-related crashes statewide.

8. Describe how this project will be implemented at UDOT.

This project will be implemented at UDOT through the Traffic & Safety program. Funding for recommended mitigation measures is available through multiple sources including the Roadway Safety Improvement Programs, the Safety Spot Improvement Program, the UDOT Signing Program, and other funding sources available to local governments. The result of this research will be extremely useful for the Department to focus available resources on reducing fatigue-related crashes.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

UDOT will benefit from this project by implementing engineering mitigation measures at those high crash locations identified to reduce crashes caused by fatigue and drowsy driving. The documented results will also be useful in aiding the Department in understanding how to best apply the signage and education efforts in the future. The ultimate goal for the project, however, is to communicate the results to law enforcement and the general public in an effort to SAVE LIVES!

10. Describe the expected risks, obstacles, and strategies to overcome these.

No known risks.

11. List the key UDOT Champion of this project (person who will help Research steer and lead this project, and will participate in implementation of the results):

Peter Tang, Traffic & Safety (801) 965-4285

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $39,500

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

	Name	Organization/Division/Region	Phone
A)	Grant Schultz	Brigham Young University	(801) 422-6332
B)	Rob Clayton	UDOT Traffic & Safety	(801) 965-4521
C)	Robert Hull	UDOT Traffic & Safety	(801) 965-4273
D)	TBD	UHP	
E)			
F)			
G)			

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

Utah Highway Patrol, Utah Highway Safety Office, NCHRP, TRB, ITE, City and County

2006 RESEARCH PROBLEM STATEMENT

Problem Title: Stone Column Treatment with Wick Drains in Silty Sands No.: 06.07-6

Submitted By: Kyle Rollins E-mail: rollinsk@byu.edu

1. Briefly describe the problem to be addressed:

Conventional wisdom indicates that stone column treatment is not effective when fines contents exceed 20%. Nevertheless, many potentially liquefiable soil profiles have fines contents greater than 20% and must be mitigated in some way. Recent experience suggests that wick drains may facilitate drainage and allow improvement with stone columns for these soils; however, procedures for quantifying the degree of improvement and desirable drain spacing are poorly developed. In addition, some case histories have shown that wick drains may not always guarantee success. No guidelines are currently available to indicate conditions when drains might be ineffective. A critical evaluation of available case histories and relevant results from lab testing and computer analyses is needed. This study should define conditions where drains will or will not improve stone column efficiency and quantify the degree of improvement that might be expected. Recommendations from this study will be particularly useful for upcoming design projects where stone column mitigation of liquefaction hazard will likely be necessary.

Strategic Goal: ☐ Preservation ☒ Operation ☐ Capacity ☒ Safety (Check all that apply)

2. List the research objective(s) to be accomplished:

1. Develop curves to predict final blow count as function of initial blow count and column spacing for silty sands with and without drains

2. Identify conditions which will limit the effectiveness of stone column treatment with wicks

3. Develop recommendations regarding design of stone columns in silty sands

3. List the major tasks required to accomplish the research objective(s): Estimated person-hours

1. Collect case histories involving stone column treatment of silty sand with and without wick drains.
2. Collect field data if cooperation and coordination can be obtained with UDOT project contractor.
2. Perform statistical analysis to evaluate improvement relative to fines content, initial blow count, drain spacing, etc.

3. Develop design curves identifying improvement with and without drains
4. Identify factors which significantly inhibit improvement and effectiveness of drains.
5. Develop design recommendations regarding use of stone columns treatment in silty sands
6. Prepare final report.

4. Outline the proposed schedule (when do you need this done, and how we will get there):

The project will be carried out over a one-year period. Geotechnical specialty contractors will be contacted for information. Hayward-Baker has already agreed to provide data from five projects involving use of wick drains with silty sands. Information from other contractors and government agencies (USBR) will be solicited. Collect field data if cooperation and coordination can be obtained with UDOT project contractor (schedule to be determined). Data collection and synthesis should take about 3 months. Analysis and development of recommendations will occupy another 6 months and the final recommendations and report will be completed in the last 3 months.

5. Indicate type of research and / or development project this is:

Large: ☒ Research Project ☐ Development Project
Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative ☐ Other _____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

University research team working in collaboration with the UDOT geotechnical group

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

Report which provides curves for predicting improvement based on soil properties and column spacing along with recommendations detailing when drains are likely to be effective or ineffective.

8. Describe how will this project be implemented at UDOT.

Workshop on report and recommendations will be provided to UDOT engineers and consultants. The design curves and recommendations can also be included in UDOT geotechnical design manual. These results will be a significant aid to engineers working on liquefaction hazard mitigation for upcoming road projects.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

Stone column treatment using wick drains has the potential for making liquefaction hazard mitigation possible for sites with high fines contents where conventional methods would be ineffective or extremely expensive. These cost savings would reduce UDOT design and construction costs.

10. Describe the expected risks, obstacles, and strategies to overcome these.

Limited test results may make it difficult to draw firm conclusions. Some additional soil testing may be necessary at some of the sites.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results): Jon Bischoff and Darin Sjoblom

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $30,000 (additional cost associated with field data collection to be determined).

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A) Brad Price	RBG Engineering, Provo, Utah	374-5771
B) Jim Higbee	UDOT/Geotechnical Group/Complex	965-4351
C) Roberto Lopez	Hayward Baker, Santa Paula, California	925-825-5056
D) Mathew Francis	URS Consultants, Salt Lake City, Utah	808-551-8006
E)		
F)		
G)		

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

Hayward-Baker, Inc., USGS, USBR.

2006 RESEARCH PROBLEM STATEMENT

Problem Title: **Evaluation of Bridges for Seismic Retrofit** No.:06.08-01

Submitted By: Keri Ryan, Utah State University E-mail: kryan@cc.usu.edu

1. Briefly describe the problem to be addressed:

UDOT plans to follow the lead of other state DOTs in identifying and updating or replacing bridges that are deficient in lateral resistance. A project is proposed to explore various retrofit techniques for different classes of bridges, and develop a procedure for future retrofit evaluation. Special emphasis is to be placed on seismic isolation as a retrofit technique. This often cost-effective approach can overcome many existing deficiencies in lateral resistance with minimal modification to the structural system, and can greatly extend the life of existing bridges. Seismic isolation has been extensively applied to bridges all over the U.S, with more than 175 total bridges and more than 40 percent in low to moderate seismic regions (Aiken et. al., 2006).

Strategic Goal: ☒ Preservation ☐ Operation ☐ Capacity ☒ Safety (Check all that apply)

2. List the research objective(s) to be accomplished:

1. Develop general guidelines for preliminary evaluation of bridges to predict the necessity of seismic retrofit and the most beneficial retrofit technique, to be used as a basis for further evaluation.
2. Develop a process for detailed retrofit evaluation of individual bridges, including use of software, modeling guidelines, and a decision-making flowchart.
3. Develop instructional material on bridge isolation systems, including representative designs for specific bridges in Utah.

3. List the major tasks required to accomplish the research objective(s): Estimated person-hours

1. Conduct a thorough literature review of seismic retrofit of bridges, including retrofit and modeling techniques. Look for correlation among bridge characteristics and retrofit techniques chosen. Interview state DOTs such as Caltrans and WSDOT for insight into evaluation procedures.

2. With UDOT staff and TAC, identify 8 existing bridges in Utah for detailed study and identify suitable general purpose finite element software for research and future evaluation.

3. Evaluate the seismic resistance of each of the 8 bridges in their existing state, and evaluate various retrofit alternatives considering both cost and performance. Retrofit techniques include strengthening of critical components, displacement enhancement (increasing seat width, column confinement), force limitation, soil improvement, and seismic isolation. In this task, a simplified capacity/demand procedure will be used wherein the force or displacement capacity of each element in the lateral load path is compared with the corresponding seismic demand.

4. Verify the results from Task 3 by detailed modeling and response history analysis with an appropriate suite of ground motions for a suitable selection of retrofit alternatives, including seismic isolation. Document the process carefully, and convert to procedural guidelines for detailed retrofit evaluation.

5. Based on Tasks 3 and 4, develop general guidelines for preliminary retrofit evaluation, to predict necessity of retrofit and most probable retrofit technique based on bridge characteristics. Incorporate simplified analysis of a larger set of bridges or a parameter study if information from Tasks 3 and 4 is insufficient.

6. Develop instructional material for UDOT engineers on the design of isolation systems, which include sample designs pertinent to the case studies in Tasks 3 and 4 documented in MathCad.

7. Prepare report and conduct training session for UDOT.

4. Outline the proposed schedule (when do you need this done, and how we will get there):

The project duration is anticipated to be approximately 36 months, with the following breakdown of the above tasks:

Task 1 = 3 month
Task 2 = 1 month
Task 3 = 8 month
Task 4 = 12 month
Task 5 = 5 month
Task 6 = 3 month
Task 7 = 4 months

5. Indicate type of research and / or development project this is:

Large: ☒ Research Project ☐ Development Project
Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative ☐ Other _____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

University in association with UDOT staff and cost consultants

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)
The deliverables are (a) a report documenting the entire research effort, (b) guidelines for preliminary seismic retrofit evaluation in bridges, (c) instructional material and examples for the design of bridge isolation systems, and (d) a process or workflow for detailed seismic retrofit evaluation including decision making and modeling techniques.

8. Describe how will this project be implemented at UDOT.
This project will be implemented by an internal evaluation of the report, and integration of the proposed design standards into a policy manual, which governs how both UDOT engineers and consultants are required to approach retrofit evaluation and seismic isolation design. The research team will conduct a training program for UDOT engineers training program for UDOT engineers illustrating the retrofit evaluation process and modeling techniques with the selected software package. At the conclusion of this project, UDOT will consider proceeding with a demonstrative seismic isolation retrofit on one of the case study bridges.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.
UDOT will benefit from by incorporating consistent evaluation and state-of-the-art seismic retrofit techniques into a bridge retrofit program. State constituents will benefit from increased safety, extended life, and long term cost savings to existing bridges. If seismic isolation is implemented, enhanced performance is expected in a seismic event.

10. Describe the expected risks, obstacles, and strategies to overcome these.
Structural systems and former construction practices for existing Utah bridges may be very diverse such that it is difficult to generalize techniques and outcomes from the case study bridges into a comprehensive evaluation program for all bridges. However, at the very least the project will be able to identify recurring classes of bridges that are at greatest risk and can benefit from a specific retrofit technique. UDOT needs to anticipate the funding needs for a long term retrofit program.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results): Boyd Wheeler

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3):
$100,000 - $120,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A) Boyd Wheeler	UDOT	
B) Marv Halling	USU	
C) Hugh Boyle	Consultant	
D)		
E)		
F)		
G)		

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:
FHWA

2006 RESEARCH PROBLEM STATEMENT

Problem Title: **Fish Passage at Utah Culverts: Strategy, Assessment, and Design** **No.:06.09-1**

Submitted By: Rollin H. Hotchkiss, Ph.D., P.E., D.WRE and Mark Belk, Ph.D., Brigham Young University **E-mail**: rhh@byu.edu

1. Briefly describe the problem to be addressed:

There appears to be no Agency strategy or pilot database in place to guide assessment of aquatic organism passage, or even fish passage, at UDOT culverts, nor does there appear to be a design procedure in place for this objective. State Departments of Transportation are becoming more involved in providing passage for aquatic organisms (amphibians and fishes) at culverts in response to endangered species listings, other agencies' initiatives, and the desire to restore ecosystem connectivity to watercourses. UDOT is responsible for approximately 61,000 culverts, but aquatic organism and fish passage is currently addressed only on an as-needed basis, sometimes resulting in unanticipated consequences. For example, a recent culvert replacement project in Logan Canyon resulted in the elimination of all fish of interest upstream from the culvert because the design specification of using a corrugated metal pipe culvert was changed to a plastic pipe in the field. The smooth interior increased velocities so much that fish could not pass upstream. An assessment strategy and design procedure for aquatic organism or fish passage at UDOT culverts is needed.

2. List the research objective(s) to be accomplished:

1. Develop a strategy for prioritizing culverts for aquatic organism or fish passage
2. Determine an appropriate assessment protocol for Utah and test it in the field
3. Create a pilot database of assessment for UDOT to build upon based upon the results from Objective 2
4. Develop a design procedure that allows for aquatic organism or fish passage through culverts.

3. List the major tasks required to accomplish the research objective(s): **Estimated person-hours**

1. Meet with relevant Federal and State Resource agencies to strategize a culvert assessment prioritization scheme – ***40 hours***
2. Using the prioritization scheme, identify the most urgent regions within the UDOT system for culvert assessment – ***800 hours***
3. Review current assessment protocols and design procedures for potential implementation in Utah. Dr. Hotchkiss is compiling such protocols and procedures as part of a current FHWA-funded project on the design of bridges and culverts for fish passage – ***80 hours***
4. Use the candidate protocol(s) on a representative sample of culverts and field verify assessment accuracy by performing fish counts – ***1100 hrs***
5. Develop a GIS database of results and assessment outcomes – ***500 hours***
6. Develop a draft procedure for the design of culverts for aquatic organism and/or fish passage – ***280 hours***
7. Write a project report documenting results and recommending future actions; develop and provide training to UDOT personnel – ***300 hrs***

4. Outline the proposed schedule (when do you need this done, and how we will get there):

The project will require 18 months. Tasks 1-3 will be completed within 5 months. The field campaign (Task 4) will take seven months and will require a summer sampling season to assure access to the selected culverts. Two months will be needed to develop the database and draft a design procedure (Tasks 5 and 6), and four months are allowed for review of the draft and final reports.

5. Indicate type of research and / or development project this is:

Large: X **Research Project** ☐ **Development Project**
Small: ☐ **Research Evaluation** ☐ **Experimental Feature** ☐ **New Product Evaluation** ☐ **Tech Transfer Initiative** :
☐ **Other** _____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

University in collaboration with UDOT and relevant agencies

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

1. A project report documenting all work
2. A GIS database of culvert assessments for use in the future and a draft design procedure for culvert design for aquatic organism or fish passage
3. Training for UDOT employees in use of assessment protocols, database construction, and culvert design

8. Describe how will this project be implemented at UDOT.

Task 4, performing field assessments, will be done with as much participation from UDOT personnel as their time and budget will allow. This will enable them to become familiar with the techniques that they can use in the future. Near the end of the project, a formal training program will be provided to all interested employees of UDOT and other agencies for culvert assessment and design. The pilot database of assessments will be maintained and grown as UDOT personnel continue the process of culvert assessment in the future.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

UDOT staff will have knowledge on how to continue the assessment program in the future. The culvert assessments can be used to prioritize fish and/or aquatic organism-friendly culvert replacements or retrofits. This strategy will save time and money. Other Federal and State Resource agencies can coordinate culvert replacements with UDOT, providing stream connectivity within a watershed that has multiple agency jurisdictions. The draft design procedure will provide UDOT hydraulic engineers a tool for specifying new culverts that will pass aquatic organisms and/or fish. Finally, the citizens of Utah will benefit from a long-term sustained fish and aquatic organism populations**.**

10. Describe the expected risks, obstacles, and strategies to overcome these.

Potential Obstacle	Overcoming the Potential Obstacle
-Interagency disagreement on priorities for assessment	Meetings early and often in the project; interagency review of work
-Extreme weather (flood or drought) that would make access to candidate culverts impossible	Be prepared to re-align the field sampling program as needed

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results):

Michael Fazio, Brent Jensen, and Denis Stuhff

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $74,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A) Tom Chart	Senior Fisheries Biologist, U.S. Fish and Wildlife Service	**801-975-3330**
B) Don Wiley	Fisheries Biologist, Utah Division of Wildlife Resources, Central Region	**801-491-5678**
C) Kris Buelow	JSRIP Local Recovery Program Coordinator, Central Utah Water Conservancy District	**801 226-7132**
D) Dan Duffield	Regional Fish Program Manager, U.S. Forest Service	**801-625-5662**
E)		
F)		

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

CUP Completion Office, Utah Department of Natural Resources Species Recovery Program, Utah Reclamation Mitigation and Conservation Commission, Federal Highway Administration

2006 RESEARCH PROBLEM STATEMENT

Problem Title:	Assessment of Mud Balance Test for Quality Assurance in Ground Anchor Installation	**No.: 06.07-3**
Submitted By:	Clifton Farnsworth	**E-mail:** cliftonfarnsworth@utah.gov

1. Briefly describe the problem to be addressed:

In the Provo Canyon Reconstruction Project we are installing thousands of feet of ground anchors (ie soil nails and rock dowels). Our current specs require the contractor to take two cube samples per day and test them to verify the grout strength. This allows verification of the grout strength at 14 days and 28 days after installation as to whether the grout met strength. However, in the meantime the Contractor can be several rows lower and if there is a problem it is almost too late too fix it. The Post Tensioning Institute recommends using the mud balance test as a means of testing the grout strength upfront. The correlations between the specific gravity (which is measured with the mud balance) and compressive strength are very good for a grout comprised of only cement and water, which is what is being used as nail grout. Grout cubes are still taken periodically to ensure that the correlations are being met. We proposed at one point a while ago that this method be used on the Provo Canyon Reconstruction, but were rejected because UDOT is unfamiliar with the mud balance test. We propose to gather cube samples from the actual construction project, perform the mud balance on the same batch of grout, and gather a set of data from the field that show the correlations between the two.

2. List the research objective(s) to be accomplished:

1. Literature search on the specific gravity (mud balance) test.

2. Use the current construction as a means of gathering mud balance and grout cubes results to show the correlations between the two.

3. Recommendations for any adjustments that may need to be made to the soil nail / rock dowel specifications.

3. List the major tasks required to accomplish the research objective(s):	**Estimated person-hours**
1. Literature search and review.	10 hours
2. Perform mud balance and make grout cubes.	Time Donated by Provo Canyon Team
3. Break grout cubes.	Cost to Break Each Cube (5 hours per week)
4. Compile correlation curves.	Time Donated by Provo Canyon Team
5. Report and Recommendations for Spec Change	20 hours
6.	

4. Outline the proposed schedule (when do you need this done, and how we will get there):

The contactor is currently installing soil nails and rock dowels and will be throughout the summer. As soon as we can get things in place we can begin gathering data. They mix up many batches of grout throughout the day at several different locations on the project, so we can also test at various times of the day and in various locations along the project. We anticipate that the work will have to be done by the end of summer though as the soil nails / rock dowels will hopefully be completed.

5. Indicate type of research and / or development project this is:

Large: ☐ Research Project ☐ Development Project

Small: ☒ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiativ

☐ Other_____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

UDOT staff (Provo Canyon Team), possibly consultant performing the actual cube breaks.

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

The current specification is not a standard specification, but rather a special, since it is only used on a project here or there. However, recommendations as to how the spec can be modified allowing for better QA/QC.

8. Describe how will this project be implemented at UDOT.

Future projects that use soil nails and rock dowels may utilize the mud balance of a means of testing up front and verifying the strength immediately as opposed to having to wait the two to four weeks to make sure we are meeting the desired strength.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

By using the mud balance with periodic cube sampling to verify the correlations, it is felt by the champions of this proposal that a better end product (soil nails and rock dowels) can be achieved. There is definitely the possibility to identify potential problems up front rather than waiting for the cube breaks.

10. Describe the expected risks, obstacles, and strategies to overcome these.

The mud balance and cube sample construction take place in the field, right in the mix of the construction environment. This sometimes allows for error to creep into the data, as opposed to being done in a pristine lab environment. However, this can also be a good thing, as the numbers show what is really happening in a real life situation. Those performing the mud balance and cube samples will have to identify a uniform way of doing this to eliminate error.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results): Clifton Farnsworth and Jim Golden (Region 3 Construction)

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $3000 - $5000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A) Clifton Farnsworth	Region 3 Construction – Provo Canyon Crew	801-830-9314
B) Jim Golden	Region 3 Construction – Provo Canyon Crew	801-222-3436
C) Scott Andrus	Region 3 Construction	801-227-8029
D) Darin Sjoblom	UDOT Geotechnical Division	801-964-4474
E)		
F)		
G)		

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

2006 RESEARCH PROBLEM STATEMENT

Problem Title: GIS Project Tracking Website

No.: 06.01-3
(see also 06.05-11)

Submitted By: Ed Rock

E-mail: erock@utah.gov

1. Briefly describe the problem to be addressed:

One of the criticisms that UDOT receives from the pubic is why we don't have better coordination between our construction projects. Sometimes this happens because transportation funding is controlled by politics and we have little control over that process. However, on other occasions this criticism is valid and could be improved if we did better planning. Unfortunately, most of the tools we use in UDOT to manage preconstruction and construction projects do not allow the projects to be viewed simultaneously in a graphical view. For example ePM is a great tool but lacks a graphical way to show projects.
We need a better tool. We need to develop a tool to graphically display all UDOT projects (both preconstruction & construction projects) in a using a GIS web environment. This would allow project managers, PICS, media, local governments, contractors, and the public to view all projects and do better planning. The user could choose to view projects on a map by type or construction, year, PM, RE, etc. The map could allow the user to click on the road to go to the Project website. ACCURATE preconstruction and construction schedules could be view (i.e, when will construction be finished, when will it be advertised).

Strategic Goal: ☐ **Preservation** X **Operation** X **Capacity** ☐ **Safety** (Check all that apply)

2. List the research objective(s) to be accomplished:

1. Develop a GIS website to display all preconstruction and construction projects. The GIS website would allow users to query projects based on various criteria and then display the results on an interactive map.

2. Evaluate how much the product is being used, if it is improving how we do business, & if it is of value to our external customers and partners.

3. List the major tasks required to accomplish the research objective(s): **Estimated person-hours**

1. Use GIS to develop a Transportation Explorer website. (1500 hours)

2. Link GIS website to ePM and PDBS databases. The would involve a effort to clean up those database so that it is GIS compatible. It could also require creating some new fields in ePM. (1500 hours)

3. Link map to project websites. (40 hours)

4. Provide training on how to use the system. (40 hours)

5. Evaluate how much the product is used and if it is improving our planning process. (80 hours)

4. Outline the proposed schedule (when do you need this done, and how we will get there):

GIS Web Development – 6 months
Modify/Clean Database – 3 months
Implementation & Product Evaluation – 6 months
Report on project effectiveness.

5. Indicate type of research and / or development project this is:

Large: ☐ **Research Project** X **Development Project**
Small: ☐ **Research Evaluation** ☐ **Experimental Feature** ☐ **New Product Evaluation** ☐ **Tech Transfer Initiative** :
☐ **Other**_____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

UDOT ETS has already started to develop a pilot version of this concept for Region Two using an AJ web developer and Chris Glazier's time. If funded, we could continue this effort and expand it Statewide by hiring AJs and involving ePM staff/resources.

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7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

GIS Project Tracking Website (GIS ePM)

8. Describe how will this project be implemented at UDOT.

Develop the GIS Project Tracking website, train users, and allow them to use and evaluate the system.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

PMs, Preconstruction Engineers, and planning can see graphically all upcoming and current projects and make better planning decisions. It would allow these groups to show ePM and PDBS data on a map.

UDOT management (Region Directors, etc) could use the tool to keep better track of projects.

PICs, the public, local governments, and the media could use the tool to see keep track of projects and find out project status/information.

10. Describe the expected risks, obstacles, and strategies to overcome these.

1. Product goes unused or underused.

2. Clean up ePM & PDBS databases to be GIS compatible and program some features (data fields) into ePM. This will require coordination and buyoff by ePM & PDBS management.

3. Rely on PMs and others to keep the database current.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results):

Ed Rock - ETS

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $95,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

	Name	Organization/Division/Region	Phone
A)	Chris Glazier	ETS - GIS	965-4381
B)	Becky Stromness	ePM	964-4518
C)	Joe Kammerer	Region Two Project Management	
D)	Jesse Sweeten	PDBS	
E)	TOC/Commuterlink		
F)	Local Govts	Public Involvement Coordinators	
G)	Marketing		
H)	RE's		

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

Consultants, AGC

2006 RESEARCH PROBLEM STATEMENT

Problem Title: **Evaluation of the Safety and Design Integrity of Two-Lane Rural Highways Using the Interactive Highway Safety Design Model (IHSDM) Developed by FHWA** No.: 06.06-2

Submitted By: Prof. Mitsuru Saito (BYU) E-mail: msaito@byu.edu

1. Briefly describe the problem to be addressed:

Two-lane rural highways comprise 77% of the nation's highway systems. Although VMT wise, they do not carry as much traffic as freeways and other major multi-lane highways, their share in the fatal crashes accounts for 44%. Head-on collisions and run-off the road crashes are some of the major crashes that two-lane rural roads experience. For instance, The US 6 has experienced a high number of crashes in spite of UDOT's efforts to improve the highway and UDOT has decided to upgrade it to a four-lane highway from Spanish Fork to Green River in the near future. It has been difficult to systematically evaluate the integrity of two-lane rural highways from various design and safety aspects. FHWA recently completed a suite of software programs named Interactive Highway Safety Design Model (IHSDM) that would help the engineers conduct crash prediction, design consistency evaluation, intersection review, policy review, and traffic analysis for two-lane rural highways. The availability of this software provides an opportunity for UDOT's design, operation, and safety engineers to evaluate two-lane highways with high crash occurrences from various aspects in order to identify improvement alternatives that would be most cost effective. It is necessary to proactively evaluate the need for improvement rather than reactively respond to the crashes that have occurred. IHSDM can be used to evaluate existing two-lane highways as well as newly planned two-way highways and can be effectively incorporated with safety audit practices.

2. List the research objective(s) to be accomplished:

1. Evaluate the capability of IHSDM using selected two-lane highways experiencing high crash rates as case studies.
2. Evaluate the usefulness of IHSDM for UDOT engineers to determine the effectiveness of improvement alternatives.
3. Evaluate how IHSDM can be incorporated with safety audit practices
4. Prepare a training course on use of IHSDM for UDOT engineers.

3. List the major tasks required to accomplish the research objective(s): Estimated person-hours: 1,400 hrs

1. Literature search focusing on safety and design integrity evaluation practices and safety audit of rural two-lane highways
2. Select at minimum three rural highway sections with high, medium, and low historical crash history
3. Collect geometric, traffic, and control data for the selected highway sections
4. Evaluate the selected highway sections and diagnose their problems by IHSDM
5. Compare the output of the analysis and actual highway conditions
6. Identify potential "hot" spots and their possible improvements
7. Evaluate the effects of alternate improvements that are proposed
8. Evaluate how IHSDM can be incorporated in the design, evaluation, and safety audit of two-lane rural highways
9. Develop a training course on IHSDM for UDOT engineers
10. Write a final report

4. Outline the proposed schedule (when do you need this done, and how we will get there):

Start early June or July 2006, complete in June or July 2007.

5. Indicate type of research and / or development project this is:

Large: ☒ Research Project ☐ Development Project
Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative：
☐ Other_____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)? University

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

1. Validation of the IHSDM
2. Proposal to UDOT to incorporate IHSDM in the process of two-lane highway safety evaluation, design, and improvement planning
3. Training course on use of IHSDM for safety audit of 2-lane highways

8. Describe how will this project be implemented at UDOT.

The IHSDM is available free of charge from FHWA. Part of the study is to find out how IHSDM fits UDOT's design process.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

UDOT will have a tool and trained engineers who can interpret the designs in terms of safety, design integrity, policy compliance, and performance.

10. Describe the expected risks, obstacles, and strategies to overcome these.

* Reluctance of the engineers to use it. * Strategy – by education and training.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results): Robert Hull, UDOT Safety Engineer (801-965-4273)

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $35,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A) Doug Anderson	UDOT R&D Division	801-965-4377
B) John Leonard	UDOT Traffic & Safety, Operations Engineer	801-965-4045
C) Robert Clayton	UDOT Traffic & Safety	801-965-4521
D) Peter Tang	UDOT Traffic & Safety	801-965-4285
E) Darin Duersch	Region 1 Traffic & Safety Engineer	801-620-1607
F) Tam Southwick	Region 2 SE Traffic & Safety Engineer	801-887-3717
G) Robert Miles	Region 2 NW Traffic & Safety Engineer	801-887-3792
H) Doug Bassett	Region 3 Traffic & Safety Engineer	801-227-8019
I) Troy Torgersen	Region 4 Traffic & Safety Engineer	435-893-4707

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study: FHWA

2006 RESEARCH PROBLEM STATEMENT

Problem Title: Asset Improvement Tracking – (construction history)

No.: 06.03-02
(also see 06.05-05)

Submitted By: Gary Kuhl & Bill Lawrence

E-mail: Gkuhl@utah.gov
Blawrence@utah.gov

1. Briefly describe the problem to be addressed:

UDOT does not have a defined process to capture information about the changes we make to our roadways. Many database systems need to be continuously updated to reflect changes made each year.

A simple form needs to be created that can be completed by anybody doing something to the system that will capture what was done, where it was done, when it was done & how much it cost.

A more involved process needs to be developed to take this information and make it available to those database managers to update their data.

This would initially capture the data needed to update the Reference System, Plan for Every Section and Pavement Management databases, as well as the HPMS database. Changes such as adding a lane, changing the median width, placing a chip seal or overlay, and many others could all be recorded and made available from one location.

2. List the research objective(s) to be accomplished:

1. Formalize a procedure to regularly obtain the as constructed information or changes that occur to the roadway.
2. Identify what information should be recorded.
3. Develop or use a current system to enter and store this data.
4. Create reporting methods that will make this information available for use in a convenient way.
5. Identify information that is already being gathered and stored from existing databases, such as ePM, MMQA and PDBS, etc.

3. List the major tasks required to accomplish the research objective(s): Estimated person-hours

1. Identify what information is needed to update the various databases.
   a. Question the functional managers for needs
2. Create a form to record these changes.
3. Identify who should enter this information.
4. Create a procedure to follow for data entry.
5. Correlate with “Data Warehouse” project to identify system to manage and report this information.
   a. Hire a consultant capable of creating the needed programming to tie in.
6. Test the system.
7. Train the users on how to access the system to enter and retrieve information.

4. Outline the proposed schedule (when do you need this done, and how we will get there):

One year project, should be completed by July 1, 2007

5. Indicate type of research and / or development project this is:

X ‘Tweener Research Project

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

In house staff with software consultant.

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

1. Project schematic describing overall concept
2. A software application to enter, manage & report the information.
3. User documentation/manual & training program.
4. A report describing the project.
5. Department Procedure defining the process.

8. Describe how will this project be implemented at UDOT.

1. A procedure will be followed to enter changes through a web-based form.
2. As needed reports will provide database managers with updated changes to keep various databases up to date.
3. System enhancements could automate the database updates.
4. System managed by Asset Management Division.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

System changes will be recorded timely and accurately creating a history of what we did. Annual tracking can be automated. Will improve our ability to make timely decisions based on performance measures, leading to better performance and economic benefit.

10. Describe the expected risks, obstacles, and strategies to overcome these.

There needs to be consistency in data entry, both in actually doing it & in what gets recorded. Will be a challenge with the Department's schizophrenia related to computer systems.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results):

Kim Schvanevelt, Pavement management & Planning Statistics

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $10,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A) Kim Schvanevelt	Systems Planning and Programming	965-4000
B) Gary Kuhl	Systems Planning and Programming	965-4000
C) Lloyd Neeley	Maintenance/Operations	965-4000
D) Bill Lawrence	Systems Planning and Programming	965-4000
E) Dave Eixenberger	Project Development	965-4000
F) Tom Leholm	Project Development	965-4346
G) Dave Blake	Region Two Materials	975-4843

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

Other DOTs interested in managing their Assets.

2006 RESEARCH PROBLEM STATEMENT

No.:06.02-01

Problem Title: Install Avalanche Sentry Monitoring System

Submitted By: Liam Fitzgerald, UDOT Avalanche Safety Director **E-mail:lfitzgerald@utah.gov**

1. Briefly describe the problem to be addressed:

Utah State Road 210 is the only link between Salt Lake Valley, the Town of Alta, the Alta Ski Area, and the Snowbird Resort. The thrust of this project is to provide safe travel for the motorists, and avoid prolonged or unnecessary closures that cost local business significant amounts of revenue.
UDOT currently employs a system of avalanche forecasting, closure, and explosives control to mitigate the avalanche hazard.
This project will install a sophisticated infrasound sound monitoring system and a central command unit to alert users of slides in the area of Little Cottonwood Canyon that is deemed the most dangerous, the White Pine/Tanner Flat Campground slide area. This system will also verify ordinance detonation and snow movement during UDOT's avalanche control work.

2. List the research objective(s) to be accomplished:

1. Demonstrate that distributed, time synchronized sensor array monitoring nodes can be successfully deployed in a continuously operating near real time monitoring system.
2. Confirm that infrasound monitoring can successfully be applied at the mid-canyon area of Little Cottonwood Canyon.
3. Show that the proposed infrasound monitoring system can be easily used by UDOT personnel during operations.
4. Determine whether project results justify adding required system annual maintenance costs to operational budgets, so that the system can be incorporated as permanent utility available to the UDOT avalanche mitigation program

3. List the major tasks required to accomplish the research objective(s):

	Estimated person-hours
1. Finalize selection of sensor array monitoring sites (June 2006)	160 Hours
2. Design and install preliminary system configuration (July – October 2006)	400 Hours
3. Operate preliminary system and heuristically adjust configuration (October – May 2007)	330 Hours
4. Optimize and finalize system configuration (June – October 2007)	310 Hours
5. Operate Optimized system and evaluate performance (October – May 2008)	230 Hours
6. Project Recommendations (June – July 2008)	
7. Project Conclusion, system removal or refurbishment (July 2008)	

4. Outline the proposed schedule (when do you need this done, and how we will get there):

See Number 3.

5. Indicate type of research and / or development project this is: Project is a Large Research Project

Large: ☐ Research Project ☒ Development Project

Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative ☐ Other

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

Consultant with support from UDOT Avalanche Staff

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

8. Describe how will this project be implemented at UDOT.

Project will follow the original installation program and be utilized in other severe avalanche locations.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

UDOT will benefit by increasing the efficiency of the avalanche mitigation program through early notification of natural avalanche activity, control activity verification, ordinance detonation verification and hazard recognition. The traveling public will benefit by reducing the risk of potential avalanche hazards. The State of Utah will benefit by minimizing the economic impact of road closures.

10. Describe the expected risks, obstacles, and strategies to overcome these.

None

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results):

Rukhsana Lindsey, Director of Research, UDOT, Liam Fitzgerald, UDOT Avalanche Safety, Ernie Scott, Inter-Mountain Labs, Inc.

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $100,000

(Total cost = $150,000, but with $100,000 commitment, National Science Foundation will participate for $50,000)

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A) Barry Sharp	**UDOT Research**	**8019654314**
B) Kevin Chartier	**Inter-Mountain Laboratories**	**3076747506**
C) Rukhsana Lindsey	**UDOT Research Director**	**8019654196**
D) Ernie Scott	**Inter-Mountain Labs, Inc.**	**3077305380**
E)		
F)		
G)		

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

RESEARCH PROBLEM STATEMENT

Problem Title: **Development of MSE wall inspection plan based on failure mode analysis and risk assessment** No.: 06.07-10

Submitted By: James A. Bay & Loren Anderson, USU E-mail: jim.bay@usu.edu

1. Briefly describe the problem to be addressed:

U-DOT has a large and growing inventory of MSE walls. These walls are a critical part of the State's transportation infrastructure. Nearly all of the critical structure of an MSE wall is buried, where it is difficult to assess its condition. Additionally, MSE walls are complicated systems where failures in several different components can lead to failure in the walls. U-DOT has variety of different types of MSE walls, which have different vulnerabilities. In order to identify and correct any problems that might arise with these walls, U-DOT needs a systematic inspection and monitoring program. We propose to develop such a program. This program will be developed based upon a probabilistic risk assessment analysis that accounts for the probabilities and consequences of failure. A panel of experts from U-DOT, the MSE wall industry, FHWA, and academia, will be assembled to determine the possible failure modes, the probabilities of failure, and the consequences of failure. Develop a failure modes analysis data base.

2. List the research objective(s) to be accomplished:

1. Develop a catalogue of U-DOT MSE walls.
2. Compile a history of MSE wall failures.
3. Assemble an expert panel to a) determine failure modes, b) assign probabilities to each failure mode, and c) evaluate the consequences of each failure mode.
4. Perform probabilistic risk assessment to identify the failure modes that contribute a significant risk for each type of wall in the U-DOT inventory.
5. Develop Failure modes analysis data base.

3. List the major tasks required to accomplish the research objective(s):	**Estimated person-hours**
1. Develop a catalogue of U-DOT MSE walls	120 hrs
2. Compile history of MSE wall failures	60 hrs
3. Assemble expert panel and provide them with catalogue and historical data	40 hrs
4. Limited field investigation to evaluate current condition of steel reinforcement	100 hrs
5. Prepare for expert panel meeting	20 hrs
6. Conduct two day expert panel meeting	48 hrs
7. Prepare report on panels findings	20 hrs
8. Perform risk assessment analysis to identify the most critical failure modes	80 hrs
9. Develop inspection and monitoring plan to mitigate risk	100 hrs
10; Train U-DOT personnel to implement the inspection and monitoring plan	60 hrs
11. Submit final report to U-DOT	30 hrs

4. Outline the proposed schedule (when do you need this done, and how we will get there):

May-Aug 2006 Prepare for panel meetings (Tasks 1-5)
Sep 2006 Conduct panel meeting (Tasks 6-7)
Oct-Nov 2006 Perform risk assessment (Task 8)
Dec 2006- Jan 2007 Develop inspection and monitoring plan (Task 9)
Feb 2007 Conduct training for U-DOT personnel (Task 10)
Apr 2007 Submit final report to U-DOT

5. Indicate type of research and / or development project this is:

Large: ☐ **Research Project** ☒ **Development Project**
Small: ☐ **Research Evaluation** ☐ **Experimental Feature** ☐ **New Product Evaluation** ☐ **Tech Transfer Initiative** :
☐ **Other** _____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

1) Catalogue of U-DOT MSE walls, 2) History of MSE wall failures, 3) Report on expert panel findings, 4) Detailed MSE wall inspection and monitoring plan, 5) Training sessions for U-DOT personnel, and 6) Final report.

8. Describe how will this project be implemented at UDOT.

The project data base will be provided to UDOT with direction on it use and recommendation for further analysis and use.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

U-DOT will benefit by having tools to asses the condition of the MSE walls in their inventory. Problems with the wall should then be identified early enough to allow for corrective actions prior to catastrophic failures.

10. Describe the expected risks, obstacles, and strategies to overcome these.

There are no particular risks in this work.

11. List the key UDOT Champion of this project (person who will help Research steer and lead this project, and will participate in implementation of the results): Jon Bischoff

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $40,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

	Name	Organization/Division/Region	Phone	Attended UTRAC?
A)	Jon Bischoff, Geotech			
B)	Jim Higbee, Legacy			
C)				
D)				
E)				
F)				
G)				

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

FHWA

2006 RESEARCH PROBLEM STATEMENT

Problem Title: Improved Performance of MSE Walls

No.: 06.07-5

Submitted By: Travis M. Gerber, BYU

E-mail: tgerber@byu.edu

1. Briefly describe the problem to be addressed:

Several MSE wall installations on UDOT projects have not performed as intended. MSE walls are complicated systems where adverse performance of one of more components can lead to wall failures. In order to assess the risk of wall failure, a failure mode analysis will be conducted by USU. Based on the findings of this analysis, changes in design and construction procedures could reduce the risks associated with particular failure modes. This project will identify specific changes in design and construction procedures which will help UDOT reduce the risks associated with MSE wall failures.

Strategic Goal: ☐ Preservation ☐ Operation ☐ Capacity ☐ Safety (Check all that apply)

2. List the research objective(s) to be accomplished:

1. Develop recommendations for revised construction and design procedures which reduce risks associated with MSE wall failure modes.

3. List the major tasks required to accomplish the research objective(s): Estimated person-hours

1. Participate in USU-initiated risk assessment panel.
2. Review results of risk assessment.
3. Correlate failure modes with elements of design and construction.
4. Conduct analytical study of wall performance in which existing design and construction procedures and proposed changes are modeled to validate and quantify the effects of the proposed changes.
5. Prepare final recommendations and report

Total estimated person hours: ~1,200 (student and faculty)

4. Outline the proposed schedule (when do you need this done, and how we will get there):

Ideally, this work would be accomplished within the six months following completion of the risk assessment.

5. Indicate type of research and / or development project this is:

Large: ☐ Research Project ☐ Development Project

Small: ☒ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative：

☐ Other _____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

University researcher with consultant experience, together with supervision and oversight by UDOT staff as part of technical advisory committee.

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)
Report containing recommendations for design procedures and specifications.

8. Describe how will this project be implemented at UDOT.
Structures Geotechnical Section and Structures Design Section will use recommendations for the design and review of MSE wall installations. Recommendations can be incorporated in specifications and design guidance documents (e.g., manual of instruction).

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.
UDOT will benefit from improved performance and reliability of MSE walls. Also, delays and reconstruction costs which have occurred when existing MSE walls have performed adversely will be avoided.

10. Describe the expected risks, obstacles, and strategies to overcome these.
The scope of potential changes and analysis is dependent upon the outcome of the risk assessment. Not all potential changes will be addressed.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results): Darin Sjoblom

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $25,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

	Name	Organization/Division/Region	Phone
A)	Jim Higbee	UDOT – Structures, Geotechnical Section	
B)	Michael Fazio	UDOT – Structures, Hydraulics Section	
C)			
D)			
E)			
F)			

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study: FHWA

2006 RESEARCH PROBLEM STATEMENT

Problem Title:	**Estimating Peak-Flow Statistics for Ungaged Streams in Utah – Development of Regional Flow-Characteristic Regression Models and a Web-Based, GIS Model User Interface**	No.:06.09-2

Submitted By:	U.S Geological Survey, Utah Water Science Center – Patrick M. Lambert, Director	E-mail: plambert@usgs.gov

1. Briefly describe the problem to be addressed:

Reliable estimates of a wide range of streamflow characteristics are needed by structure designers and resource managers. Throughout most of Utah, streamflow statistics are only available for gaged locations. Currently, those interested in acquiring these types of streamflow statistics for ungaged streams must conduct their own analyses. Comprehensive data acquisition, selection and proper employment of statistical techniques and quantitative evaluation of final results are critical components in these analyses but can be very costly and time consuming to obtain. Without a comprehensive geographic information system (GIS), complete with developed and evaluated streamflow statistical models, those in need of flow statistics acquire data from different sources, use an assortment of evaluation techniques, and generate results of varying confidence. A Web-based streamflow statistical tool will provide structure designers and resource managers with consistent and accurate streamflow estimates in a timely manner at low cost.

2. List the research objective(s) to be accomplished:

1. Compute flow statistics for USGS streamflow gaging stations in Utah and in drainages shared by adjoining states.

2. Develop regional regression equations for estimating a range of flow statistics for sites on ungaged streams in Utah.

3. Provide this up-to-date, statistical streamflow information for gaged and ungaged sites via an interactive Web-based tool known as StreamStats customized specifically for Utah streams.

3. List the major tasks required to accomplish the research objective(s): Estimated person-hours

1. **Delineate statistically significant geohydrologic regions**. – Delineate geohydrologic regions using three factors: (1) statistically defined groups of similar basin and climatic characteristics; (2) significant physiographic features; and (3) scientific judgment based upon general knowledge of the area

2. Streamflow statistics computation at gaged sites – Calculated flood frequency estimates along with low, and monthly and annual streamflow statistics for all Utah gaging stations with 10 or more years of daily mean discharge record.

3. **Ungaged streamflow statistics estimation** – Develop regional regression equations to predict the cooperator-selected streamflow statistics at ungaged locations for each of the geohydrologic regions in Utah. These models will be built upon regional relationships between drainage basin and climatic characteristics, and computed and estimated streamflow statistics at gaging stations.

4. **Web-based user interface –** Prepare Utah geographic data for implementation into USGS national StreamStats Web-based application. StreamStats database and user interface tool will be populated with desired Utah GIS data layers. Utah streamflow gaging station statistics and developed regional regression equations will be incorporated into the national StreamStats Web-based application.

4. Outline the proposed schedule: This project is conducted by the U.S. Geological Survey in cooperation with UDOT and the Utah Department of Natural Resources (UDNR) in support of these State agency's design and resource management information needs. The project is ongoing – funded in part by the UDNR and USGS funds. UDOT funding for the project is approved in State fiscal year 2006, however the USGS/UDOT joint funding agreement has not been delivered back to the USGS office. This delay has delayed progress on the project relative to the original schedule. The project will continue on the below schedule with requested UDOT funding in FY2007.

(1) Delineate geohydrologic regions: 4/2006-8/2006,

(2) Computed streamflow statistics at gaged sites: 4/2006-6/2006

(3) Estimate (model) ungaged streamflow statistics: 7/2006-8/2007

(4) Develop GIS data base and implement web user interface and reporting – 10/2005-8/2007

All tasks will be completed by the USGS with regular reporting of progress and plans to UDOT managers.

5. Indicate type of research and / or development project this is:

Large: x Research Project ☐ Development Project

Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative： ☐ Other

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)? The Streamstats technology is unique to the USGS. They are also the collecter and maintainer of the model data and best suited for this work.

7. What deliverable(s) would you like to receive at the end of the project? All processed and computed data will be incorporated within the Utah StreamStats web-based GIS tool and accessible to UDOT designers. For each set of statistical models that are developed, a USGS report describing their development, application and use will be prepared. Documentation for the Utah StreamStats application will be prepared and made accessible from the StreamStats interface.

8. Describe how this project will be implemented at UDOT. Project deliverables will be developed and completed by the USGS. Project products including streamflow statistics models and web-base user interface will be available for use by UDOT staff at the end of the project. Reports documenting the streamflow statistics models and user interface will be published by the USGS and made available to UDOT staff.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be. The project will:

- Provide updated, accurate information on streamflow statistics (streamflow regression models for peak-flow statistics) for gaged and ungaged sites on streams in all Utah basins.
- Incorporate all available streamflow data at gaged streams to improve the accuracy of model-computed streamflow statistics.
- Incorporate new GIS environmental-characteristic data layers, not readily available or synthesizable in previous studies, to improve the accuracy of the modeled relation between basin characteristics and streamflow.
- Create a Web-based user interface that will allow access to and use of the model via an interactive map server eliminating the need for costly independent analyses
- Allow on-the-fly basin delineation from a user-defined stream point and immediate computation of delineated basin characteristics required by the streamflow regression equations. (Basin characteristics computation via the Web applications ensures that the method for computation is the same as that used in the development of the regression equations.)
- Provide estimated streamflow statistics for user-selected ungaged sites and standard errors of estimate or prediction and confidence intervals.

Resulting tools will save UDOT designers significant time and money by allowing point and click computation of streamflow statistics needed for road and structure design near water features.

10. Describe the expected risks, obstacles, and strategies to overcome these. Timely completion of funding agreements is key to meet project timelines. The USGS will prepare a Joint Funding Agreement for each fiscal year of funding to allow use of USGS Cooperative Water Program matching funds in support of the work.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results): Michael Fazio, UDOT Manager, Central Hydraulics

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): UDOT project contribution in FY2006 was $35,000. The estimated UDOT contribution in FY2007 is $35,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

	Name	Organization/Division/Region	Phone
A)	Boyd Clayton	Utah Department of Natural Resources Quality, Div. of Water Rights	538-7390
B)	Todd Adams	Utah Department of Natural Resources, Div. of Water Resources	538-7272
C)			
D)			

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

Utah Department of Environmental Quality, Water Quality, US Forest Service,

2006 RESEARCH PROBLEM STATEMENT

Problem Title: Calibration and Validation of I-15 VISSIM model **No.:** 06-05.7

Submitted By: Peter T. Martin and Aleksandar Stevanovic **E-mail:** aleks@trafficlab.utah.edu

1. Briefly describe the problem to be addressed:

The purpose of this project is to build, calibrate, and validate VISSIM model of I-15 from SR 201 (or 600 N) to University Parkway. UDOT has started developing a VISSIM microsimulation model for evaluation of the HOT lanes on I-15 from SR 201 to University Parkway. Microsimulation models are required tools for evaluation of HOV and HOT facilities. However, microsimulation models require much more details when building and calibrating the models. The calibration of microsimulation parameters (e.g. car-following parameters, speed and acceleration distributions) is very essential to validate simulations results with the observed performance measures. The proper validation of simulation parameters will enable successful evaluation of the proposed HOT lanes on I-15. Utah Traffic Lab has a lot of experience in building and calibrating VISSIM and VISUM models.

2. List the research objective(s) to be accomplished:

1. Identify the proper calibration methodologies considering various possible scenarios
2. Already complete
3. Compare and evaluate simulated and measured travel variables and make recommendations

3. List the major tasks required to accomplish the research objective(s): Estimated person-hours

1. Develop project scope
2. Prepare brief literature review
3. Propose research methodology (data collection, calibration, validation)
4. Integrate material and data already developed and gathered by UDOT
5. Collect data (UTL - real time connection to the TMS data)
6. Calibrate VISSIM model by using Genetic Algorithm or other optimization searching tools
7. Validate VISSIM model for an independent data set (not used in calibration)
8. Report findings to UDOT **Total of 333 person-hours**
9. Deploy Genetic Algorithm calibration tool in UDOT Planning Division.
10. Note: There is a dollar for dollar match by the MPC.

4. Outline the proposed schedule (when do you need this done, and how we will get there):

Scope and literature review – by June 2006

Methodology and model integration – by September 2006

Data collection and calibration – by January 2007

Data collection and validation – by April 2007

Report, Procedure, Training, and Software to UDOT – by June 2007

5. Indicate type of research and / or development project this is:

Large: ☒ Research Project ☐ Development Project

Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative：

☐ Other_____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

Training, Report, Procedure, Software

8. Describe how will this project be implemented at UDOT.

UDOT Planning and TOC engineers will use the calibrated and validated model for the evaluation of HOV and potentially HOT lanes. They will also be able to use developed software for future calibration of the VISSIM models.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

Beneficiaries will be engineers who will use I-15 VISSIM model for evaluation of various car pool policies on the HOV lanes or any other projects that requires VISSIM calibration in future.

10. Describe the expected risks, obstacles, and strategies to overcome these.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results): Eric Rasband, Michael Kaczorowski

12. Estimate the cost of this research study including implementation effort use person-hours from No. 3： $30, 000(UDOT)

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A)		
B)		
C)		
D)		
E)		
F)		
G)		

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

The USDOT funded Mountain Plain Consortium will match the UDOT contribution dollar for dollar.

2006 RESEARCH PROBLEM STATEMENT

Problem Title: Calibration of AASHTOs New Prestress Loss Design Equations **No.:**06.08-2

Submitted By: Paul Barr and Marv Halling **E-mail:** Pbarr@cc.usu.edu

1. Briefly describe the problem to be addressed:

In the next edition of the AASHTO LRFD Bridge Design Specifications the procedure to calculate prestress losses will change dramatically. The new equations are empirically based on high performance concrete from four states (Nebraska, New Hampshire, Texas and Washington). The material testing resulted in modified equations to predict elastic shortening, shrinkage and creep. Because high performance concrete has traditionally resulted in smaller prestress losses these new equations also estimate lower losses in comparison to the existing equations. Many of the bridges built in Utah do not use specifically high performance concrete, but a self consolidating concrete that is different that the mixes that were used to develop the new AASHTO equations. This research is two fold: 1- obtain design parameters elastic modulus(i.e., k_1 and k_2 for the elastic modulus)shrinkage and creep for typical Utah concrete girders mixes and 2- quantify the effects of deck casting and differential shrinkage on prestress gains to be used in the new procedures.

2. List the research objective(s) to be accomplished:

1. Obtain design parameters for elastic modulus for typical Utah prestressed concrete mix designs.
2. Obtain ultimate shrinkage and creep values for typical Utah prestressed concrete mix designs.
3. Provide design recommendations for prestress losses for typical Utah prestressed concrete mix design.
4. Quantify the effects of deck casting, differential shrinkage and camber by instrumenting a typical prestressed concrete bridge.
5. Prepare final report.

3. List the major tasks required to accomplish the research objective(s): **Estimated person-hours**

1. Obtain and test various concrete samples from representative precast plants (Eagle precast , Encon and possibly an Idaho plant) for elastic modulus, shrinkage and creep. (680 hours)
2. Analyze data in order to obtain design parameters for elastic modulus (k_1 AND K_2) , shrinkage (ε_{shult})and creep that will be specific for concrete mix designs within the state of Utah. (160 hours)
3. Instrument and monitor a prestressed concrete girder bridge to evaluate stress gains due to deck casting and differential shrinkage. (700 hours)
4. Compare design parameters with in situ results and provide design parameters for elastic shortening, shrinkage, creep, prestress gains due to deck casting and differential shrinkage. (240 hours)
5. Prepare final report (100 hours)
6.

4. Outline the proposed schedule (when do you need this done, and how we will get there):

Task 1 – 6 to 8 months

Task 2 – 2 months

Task 3 – 12 months

Task 4 – 3 months

Task 5 (report preparation and presentation)- 1.5 months

5. Indicate type of research and / or development project this is:

Large: ☐ Research Project ☐ Development Project

Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative：

☐ Other_____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

University

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.) The deliverable will be in terms of a of a report or manual of practice that provided specific design values for the calculation of elastic modulus, shrinkage and creep which would be used for the estimation of prestress losses.

8. Describe how will this project be implemented at UDOT.

This research will be implemented at the design stage for the structural engineer. With the new AASHTO design procedures, it is anticipated that engineers will use these results for each prestressed concrete bridge that is designed and built within the state of Utah.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

The beneficiaries will ultimately be the tax payers. Over or under predicting prestress losses can affect both the service and ultimate limit states. When bridges are deemed to perform unsatisfactory prior to reaching an adequate design life the replacement cost can be detrimental to a DOT especially with limited budgets. This project will provide design parameters that will enable the engineer to design precast, prestressed concrete bridges that will be exhibit better service performance. This will hopefully improve the service life of the bridges.

10. Describe the expected risks, obstacles, and strategies to overcome these.

The major obstacles will be with obtaining representative samples and a representative bridge. Marv and I have recently spent time at Eagle Precast and have developed a good working relationship with their QC personnel. They seem very willing to work with and our previous experience will be valuable. We also intend to work with Encon Precast and develop similar relationships. We hope that this investment will pay dividends for both UDOT and the specific research project.

11. List the key UDOT Champion of this project (UDOT employee who will help Research Division steer and lead this project, and will spearhead the implementation of the results): Boyd Wheeler or Ray Cook

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3): $80,000

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone
A) Boyd Wheeler		
B) Ray Cook		
C) Dan Church		
D) Robert Nash		
E)		
F)		
G)		

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study: Any department of transportation, FHWA or design agency that will design prestressed concrete bridges using the new AASHTO procedures.